1 The Practice of Pediatric Anesthesia

Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children

Author(s): Charles J. Coté, Jerrold Lerman, Brian J. Anderson

The basic principles of the practice of pediatric anesthesia can be applied regardless of the circumstances; they provide the foundation for safe anesthesia. Preoperative evaluation and management of both the child and caregivers is important. The benefits and risks of the anesthetic procedure must be presented in clear, easily understood terms. The child's medical record should be examined for pertinent information before induction of anesthesia. Anesthesiologists must fully understand the proposed surgical, medical or investigative procedure to facilitate the planning of an appropriate level of monitoring and selection of anesthetic drugs and technique. Ongoing communication between the anesthesiologist and surgeon is important if the anesthesiologist is to anticipate potential changes in a child's physiologic status due to surgical manipulations, and deal with them immediately, appropriately, and effectively. The most important aspect of basic monitoring consists of using the senses of sight, hearing, and touch to integrate all the data provided by patient observations and the monitors. The anesthesiologist's responsibility to a child does not end at completion of surgery but continues into PACU. Follow-up after anaesthesia determines patient level of satisfaction and identifies any complications that may have occurred.

2 Growth and Development

Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children

Author(s): Bruno Marciniak

Growth is the quantitative increase in physical development of the body, whereas maturation includes the genetic and biologic development of the child; both phenomena advance during pregnancy and continue after birth. All organ systems undergo maturation changes and most are complete within the first few years of life. Normal physiological variables in infancy and childhood are quite different from adults. Physical growth can be assessed by changes in weight, height and head circumference. These can be readily plotted over time to
determine disparities between normalcy and those indicating disease onset or other effects compromising growth. Cerebral immaturity and plasticity impacts on sensitivity to drugs, pain responses, behaviour and increases potential harm from apoptosis with anesthesia. The heart undergoes transition from fetal to adult circulation during the first few weeks of life. Undiagnosed congenital defects are not uncommon. Respiratory anatomy and mechanics affect propensity to apnea, airway maintenance, artificial ventilation modalities, uptake of inhalational agents and endotracheal tube sizes. Metabolic rate and oxygen requirements decrease with age. This physiology influences diverse aspects that include the rate of desaturation during apnea, hypoglycaemia during starvation, cardiac output, drug metabolism, fluid requirements and heat production or loss. It is incumbent upon the anesthesiologist to understand the developmental changes that occur in the neonate and infant over time, and how these changes affect physiologic responses to diseases, drug pharmacokinetics and pharmacodynamics.

4 Preoperative Evaluation, Premedication, and Induction of Anesthesia

Adequate preparation of children for anesthesia allows optimization of medical conditions and leads to decreased morbidity. The medical history and laboratory testing obtained preoperatively aid the anesthesiologist in determining readiness for the planned surgery. Preparedness begins with adherence to a preoperative fasting schedule for elective surgery, selecting appropriate premedication, formulating an anesthetic plan and anticipating postoperative concerns. There are a variety of techniques for inducing general anesthesia. The technique used depends on a number of factors including the child's developmental age, understanding and ability to cooperate, previous experiences, the presence of a parent and the interaction of these factors with the child's underlying medical or surgical conditions. This chapter discusses special problems encountered in the pediatric population that require additional considerations from anesthesiologists. The preoperative period can be a stressful time for the fearful child and for those with autism spectrum disorders thus requiring the anesthesiologist to tailor the approach to meet the child's needs. Other challenges that pediatric patients present include respiratory system conditions such as obstructive sleep apnea syndrome, bronchopulmonary dysplasia, difficult airway, upper respiratory tract infections and apnea in former preterm infants. Additional conditions that are discussed include diabetes, seizure disorders, and sickle cell disease. Finally, the detection of a cardiac murmur, anemia or a fever before elective surgery will present a dilemma whether to proceed. The preoperative visit is an essential component of identifying the pediatric patient's needs and devising a plan that leads to a superior patient experience, a decrease in the number of cancellations and improved outcomes.

5 Ethical Issues in Pediatric Anesthesiology
Bioethics for pediatric patient centers on seeking, respecting and incorporating preferences from children of varying ages and maturity while incorporating the preferences of surrogate decisions makers, most often the parents. Operationalizing these practices requires understanding the following social, ethical, and legal concepts: (1) How age enables giving assent and consent; (2) The best interest standard in determining what care is acceptable for a child unable to communicate; and (3) Assent in determining the extent of authority given to children's preferences, particularly as they near the age of majority. These concepts help guide decision making about prickly issues for minors, such as confidentiality, pregnancy, abortion, emergency care, end-of-life care, and when parents are too impaired to give informed consent.

6 Pharmacogenomics

Pharmacogenomics is a rapidly evolving and novel science that has the potential to revolutionize the way we deliver anesthesia and analgesia to pediatric and adult patients. It allows for personalization of drug delivery tailored to an individual’s genetics and their consequent influence on drug metabolism, exposure and effects. In this chapter, we present some historical perspectives and basics of pharmacogenomics. Early discoveries in this field are tied to anesthesia, such as cholinesterase deficiency and malignant hyperthermia. We discuss developmental pharmacogenetics with relevance especially for the youngest pediatric patients, and then extensively describe the role of genetic variants of the phase I and II liver enzymes on the pharmacokinetics of commonly used drugs in anesthesia and analgesia. Particular attention is devoted to the CYP2D6 genetic variants which have recent implications in opioid analgesia, leading to regulations for codeine use in children less than 18 years old. Genetics affecting drug effects (pharmacodynamics) and perioperative outcomes like postoperative nausea are also described. The goal of understanding genomics is clinical translation to improve patient outcomes; costs and insurance coverage of genetic tests, limitations of research studies and interpretations of results and patient implications are deterrents to this goal. By integrating genomic data into electronic health records, creation of decision support systems and empowering anesthesia providers with information about pharmacogenomics, implications, and availability of current online sources, precision medicine is potentially poised to make anesthesia delivery safer and more efficient, although this is still a work in progress.

7 Pharmacokinetics and Pharmacology of Drugs Used in Children

Pharmacokinetics and pharmacology of drugs used in children
The pharmacokinetics (PK) and pharmacodynamics (PD) of most medications in children especially neonates, differ from those in adults. Children exhibit different PK and PD from adults because of their immature renal and hepatic function, different body composition, altered protein binding, distinct disease spectrum, diverse behavior, and dissimilar receptor patterns. PK differences necessitate modification of the dose and the interval between doses to achieve the desired concentration associated with a clinical response and to avoid toxicity. In addition, some medications may displace bilirubin from its protein binding sites and possibly predispose to kernicterus in premature neonates. Drug effect may be influenced by altered capacity of the end organ, such as the heart or bronchial smooth muscle, to respond to medications in children compared with adults. In this chapter we discuss basic pharmacologic principles as they relate to drugs commonly used by anesthesiologists.

8 Total Intravenous Anesthesia and Target-Controlled Infusion

Total intravenous anesthesia (TIVA) is the use of intravenous agents for induction and maintenance of anesthesia. The most frequently used agent is propofol. Propofol effect is usually augmented with an opioid (e.g., remifentanil). Although it is possible to implement TIVA using pumps with the infusion rate controlled manually, the advent of pumps programed with pharmacokinetic information has facilitated use. The use of published pharmacokinetic parameter sets (referred to as models and often described by the principle author) allows the pump to determine infusion rates to maintain a certain plasma concentration (Cp) or effect site concentration (Ce). Covariate knowledge (e.g., weight, age) allows individualization of dose. There are limited data in the neonatal and infant populations. Common indications for TIVA techniques include children at risk for malignant hyperthermia, procedures with a high risk of postoperative nausea and vomiting, brief radiologic or painful procedures when rapid recovery is needed and frequent repeated anesthesia. However, use is spreading to other fields. Fears that children may develop propofol infusion syndrome during routine anesthesia have not eventuated.

9 Fluid Management

Fluid and electrolyte disturbances are common among children and fluid management is critical to the successful care of a wide range of pediatric conditions. This chapter outlines the basic anatomy and physiology of fluid compartments, their developmental maturation, and a general approach to fluid administration. Clinical assessment of hydration states, perioperative fluid management, and the care of common pathophysiologic states are discussed in
detail. Specific attention is given to acid–base balance and to disorders of sodium, potassium, and water homeostasis.

10 Essentials of Hematology

Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children

Author(s): Trevor L. Adams, Gregory J. Latham, Michael J. Eisses, M.A. Bender, Charles M. Haberkern

Pediatric hematologic diseases, while relatively uncommon, pose significant morbidity and mortality. These children commonly undergo a host of diagnostic or therapeutic surgeries and procedures that require anesthesia. A sound understanding of hematological physiology across all age groups is required to safely anesthetize these children. In addition, the complexity of treatment options for many hematologic disorders have expanded, including hematopoietic stem cell transplant, which highlights the need to collaborate perioperatively with the child's hematologist, surgeon, or oncologist for optimal care.

12 Strategies for Blood Product Management, Reducing Transfusions, and Massive Blood Transfusion

Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children

Author(s): Charles J. Coté, Eric F. Grabowski, Christopher P. Stowell

This chapter presents a review of all blood components, the storage and processing of blood products, specific indications for administration of platelets, fresh frozen plasma, cryoprecipitate, factor concentrates, albumin, dextrans, starches, and gels. Basic estimations are detailed of the circulating blood volume, formulas for correcting anemia, thrombocytopenia, or other factor deficiencies are detailed. Indications are presented for leukocyte-reduction, risk for cytomegalovirus transmission, children at risk for transfusion-associated graft-versus-host disease, as well as the indications for and risks associated with blood product irradiation. The chapter offers considerable detail regarding massive blood transfusion from the perspective of the pediatric patient, particularly infants, with a comprehensive discussion of potential complications such as dilutional thrombocytopenia, dilutional coagulopathy, factor deficiency, acute hypocalcemia (citrate toxicity), hyperkalemia, changes in acid-base balance, and the potential adverse effects of hypothermia. Associated issues are also discussed such as transfusion associated circulatory overload (TACO) and transfusion-related acute lung injury (TRALI). The chapter describes the risks for infectious disease transmission and the remarkable overall safety of blood transfusion in the age of modern blood banking. New threats from endemic infections such as Dengue, Chikungunya, malaria, the Zika virus and the technical and logistical limitations for screening for such rare pathogens are considered. Additionally, a comprehensive discussion is presented of methods to reduce patient exposure to allogenic blood components, such as presurgical administration of erythropoietin, preoperative blood donation programs, intraoperative blood recovery, autotransfusion, controlled hypotension
Pulmonary complications are a major cause of perioperative morbidity in the pediatric population. Although preexisting pulmonary pathologic processes in children can present significant challenges to anesthetic delivery, a thorough assessment of the problem combined with meticulous anesthetic management allows most children to undergo surgical interventions without long-term adverse sequela. Asthma, cystic fibrosis and sickle cell disease continue to pose challenges during anesthesiology. Consultation with a pediatric pulmonologist is indicated when appropriate for specific problems as outlined in this chapter; a team approach may markedly improve operative and postoperative outcomes.

This chapter reviews the developmental anatomy and physiology of the pediatric upper airway as it relates to the practice of pediatric anesthesia. Differences between the pediatric and adult airways are important determinants of anesthetic techniques. Knowledge of normal developmental anatomy and physiologic function is required to understand and manage both the normal and the pathologic airways of infants and children. Techniques of mask ventilation, oral and nasal airway placement, use of supraglottic devices, and tracheal intubation are reviewed for normal and anatomically abnormal pediatric patients.

Anesthesiologists caring for infants and children who require a thoracic surgical
procedure face many challenges. In particular, the airway equipment needed requires special skills and understanding of the limited space available in the airway for proper placement of special tracheal tubes. A working knowledge of respiratory physiology and anatomy in infants and children is also required for the planning and execution of appropriate intraoperative care. The appropriate airway device and its size in a particular child depend on the pathology being managed, physiological changes, the child's age and size and the surgical technique used. Specialized techniques such as anesthesia for thoracoscopy or video assisted thoracic surgery (VATS), one lung ventilation and anesthesia related issues, the use of bronchial blockers, Univent tubes, double lumen tubes, and consideration of specific lesions such as subglottic stenosis, pulmonary sequestration lesions, bronchogenic cysts, cystic adenomatoid malformation, congenital lobar emphysema, congenital diaphragmatic hernia, tracheoesophageal fistula and esophageal atresia are discussed. The pathophysiology and management strategies for anterior mediastinal masses, including an algorithm for evaluation of these masses, are also presented.

16 Essentials of Cardiology
24 mai 2018
Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children

Author(s): Wanda C. Miller-Hance, Ralph Gertler

Congenital heart disease (CHD) is the most common birth defect affecting approximately 1% of live births. Although CHD is the leading cause of neonatal mortality, advances over the last several decades including significant contributions related to anesthesia care, now allow for survival of most affected infants. The wide spectrum of congenital cardiovascular anomalies and the various types of acquired heart disease in the pediatric age group presents a challenge to the clinician who does not specialize in the care of these children. Even for those with a focus or interest in cardiovascular disease, the range of structural defects, myocardial disorders, and other conditions, and the varied associated hemodynamic perturbations can be overwhelming. The ability to provide optimal perioperative care to affected children heavily relies on a clear understanding of the basic pathophysiology of the congenital anomalies and acquired diseases, familiarity with the commonly used diagnostic modalities in cardiology and their clinical applications, and medical and surgical treatment options available to affected individuals. In this chapter, we present essential concepts in cardiology to enhance the overall knowledge of the practicing anesthesiologist in pediatric cardiovascular disease.

17 Anesthesia for Children Undergoing Heart Surgery
24 mai 2018
Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children

Author(s): Angus McEwan, Vasco Laginha Rolo

This chapter outlines anesthesia for cardiac surgery in children. These children require a thorough preoperative evaluation and an assessment of a number of perioperative challenges including cyanosis, intracardiac shunting and impaired hemostasis. The anesthetic management during cardiopulmonary bypass
focusing on monitoring, induction and maintenance of anesthesia and the institution of and separation from bypass. Depending on which heart defect is present, the variables and drugs that control both systemic and pulmonary vascular resistances during anesthesia are detailed. In addition, a review of the drugs used in pediatric cardiac anesthesia, the use of regional anesthesia in these children, fast-tracking, cardiopulmonary bypass and the stress response to cardiac surgery are discussed. The anesthetic considerations for specific cardiac defects including left-to-right shunts, right-to-left shunts and aortic stenosis are presented. Finally, the considerations for transport and transfer of these children after surgery to the pediatric intensive care unit are outlined.

18 Cardiac Physiology and Pharmacology

Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children
Author(s): Annette Y. Schure, James A. DiNardo

This chapter describes important features of the fetal circulation, essential changes at birth and other age-specific developments of the cardiovascular system. The incidence, prevalence and basic pathophysiological principles of congenital heart defects are presented. Several special situations are discussed in more detail: the exercise physiology of patients with repaired congenital heart disease, the Fontan physiology and the transplanted heart. Indications and practical considerations for the use of various vasoactive and antiarrhythmic drugs are reviewed.

19 Cardiopulmonary Bypass and Management

Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children
Author(s): Ralph Gertler, Erin A. Gottlieb, Dean B. Andropoulos

Cardiopulmonary bypass (CPB) is an imminent element of today’s cardiac surgery. Major differences not only exist in setup and materials, but also in management strategies. The phases of CPB are similar to the adult, but the effects on the body and the physiological disturbances are far more pertinent. Hemodilution is the major hematologic disturbance that leads to coagulation deficiencies and challenges the oxygen transport capacities of the body. Hemodilution and the membrane oxygenator itself change the pharmacokinetics and pharmacodynamics of most anesthetics in use. Physiological limits are permanently reached during pediatric cardiac surgery and are most obvious during the care of Jehova’s Witness patients. Lower body temperatures than in adults are routinely used which influences acid base management. Special techniques applied are deep hypothermic circulatory arrest and selective cerebral perfusion which enable a broad spectrum of today’s congenital cardiac surgery. Despite technical advances widespread effects on the body systems remain and these changes can prolong the postoperative course and endanger a primarily successful repair.
23 Anesthesia for Noncardiac Surgery in Children With Congenital Heart Disease

The last several decades have seen remarkable advances in medical and surgical care of children with congenital heart disease (CHD). This progress has resulted in decreased morbidity and overall improvements in long-term clinical outcomes. As survival rates continue to improve, an escalating number of affected children will present for noncardiac surgery or other procedures unrelated to their heart disease. The care of these children is becoming more common in all diagnostic and surgical venues. The challenges of caring for children with CHD for noncardiac surgery are magnified by the wide range of defects, each with specific physiologic perturbations, hemodynamic consequences, and severity of disease. This is further complicated by the variety of medical and surgical strategies available for management of these conditions. Optimal anesthesia care requires a thorough understanding of the underlying cardiovascular anatomic abnormalities, pathophysiologic consequences of the malformation, functional status, residua, sequelae, and expected long-term outcome, in addition to the planned procedure and potential complications. In this chapter, general principles of anesthesia practice are reviewed, as they pertain to the care of children with CHD during noncardiac surgery. Unique perioperative considerations and issues applicable to high-risk patient groups are also addressed.

24 Essentials of Neurology and Neuromuscular Disorders

Despite the increasing safety of anesthesia, perioperative cardiopulmonary resuscitation in infants and children remains a common event. Successful resuscitation to spontaneous circulation requires early recognition and coordination of a team of practitioners to function effectively to deliver best practice CPR. Additionally, the perioperative and operative environment adds further challenges to delivery of effective CPR. Vigilance and following best evidence practice remain critical for the prevention and mitigation of critical events in the perioperative setting.

25 Surgery, Anesthesia, and the Immature Brain

Despite the increasing safety of anesthesia, perioperative cardiopulmonary resuscitation in infants and children remains a common event. Successful resuscitation to spontaneous circulation requires early recognition and coordination of a team of practitioners to function effectively to deliver best practice CPR. Additionally, the perioperative and operative environment adds further challenges to delivery of effective CPR. Vigilance and following best evidence practice remain critical for the prevention and mitigation of critical events in the perioperative setting.
Millions of children are exposed to general anesthetics every year to undergo surgical operations and painful interventions worldwide. Research in animals has raised substantial concerns regarding the effects of anesthetic exposure on the developing brain and several epidemiological studies have addressed this important clinical concern. This chapter assesses available animal studies into the effects of commonly used anesthetics on brain structure and cognitive function and their relevance to clinical pediatric anesthesia practice as well as the current clinical evidence. Studies were identified using searches of medical databases, queries of recent review articles, and personal records. The number of laboratory studies into anesthetic neurotoxicity has increased dramatically in the past 10 years, demonstrating compelling evidence for both brain structural abnormalities as well as impaired long-term cognitive outcomes following prolonged exposure to anesthetics early in life. In humans, several epidemiological studies have associated anesthesia for surgery early in life with subsequent neurobehavioral abnormalities, while others, including the interim results of a randomized controlled trial as well as a recent ambi-directional study, have not found any effect of inhaled anesthetic exposure in infancy on subsequent cognition. However, the potentially most susceptible age as well as the phenomenon's underlying mechanisms are not well described. Accordingly, given the serious implications for public health, further research, both in animals and in humans, is urgently needed to better define human applicability of animal data and to devise potential mitigating strategies.

Children who require neurosurgical procedures present unique challenges to pediatric anesthesiologists. In addition to common concerns of anesthetizing children, anesthesiologists must pay special attention to the effects of anesthesia on the developing central nervous system of children. An understanding of normal neurodevelopment throughout childhood is essential to effectively care for children with neurologic and neurosurgical disease. Further, a thorough understanding of the pathophysiology of a variety of central nervous systems processes is incumbent upon the anesthesiologist caring for children with such diseases. Practitioners must account for both normal and abnormal variants of intracranial pressure, cerebral blood flow, cerebral perfusion pressure and cerebrovascular autoregulation. Special attention must be paid to basic aspects of pediatric anesthetic practice when caring for children with central nervous system pathology. Such aspects include preoperative evaluation, premedication, monitoring, airway management, positioning, fluid management, and emergence. Patients undergoing a variety of neurosurgical procedures may be at particular risk for venous air emboli and caregivers must understand the pathophysiology, monitoring, and treatment of this potentially catastrophic event. Finally, anesthesiologists must have a strong grasp of the anesthetic implications as they relate to a wide variety of neurosurgical procedures performed on children. These include craniotomy, brain biopsy, revascularization procedures, shunt surgery, endoscopic procedures, and care of neurotrauma. Many of these procedures may need to be performed in potentially hostile, off site locations such as the diagnostic radiology, interventional radiology or intraoperative MRI suite.
27 Essentials of Endocrinology
24 mai 2018

Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children

Author(s): Elliot J. Krane, Erinn T. Rhodes, Rebecca E. Claure, Echo Rowe, Joseph I. Wolfsdorf

This chapter presents the most up to date recommendations regarding the perioperative management of children with diabetes. All the commonly used insulin preparations are discussed along with their pharmacokinetic and pharmacodynamic profiles. The chapter is loaded with detailed decision algorithms for all expected surgical/anesthesia related issues such as intraoperative insulin infusions. In particular methods for accurately estimating the need for additional insulin and what type of insulin is recommended as it relates to current hyperglycemic values and the child's normal daily insulin requirements (“correction factor” calculation). Diabetes insipidus, the syndrome of inappropriate antidiuretic hormone secretion, thyroid disorders, thyroid crisis, hypercalcemia, hypocalcemia, adrenal insufficiency, steroid replacement therapy, and management strategies for pheochromocytoma are also presented. All aspects are presented from the perspective of pediatric specialists and pediatric anesthesiologists to achieve the most cogent recommendations.

28 Essentials of Nephrology
24 mai 2018

Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children

Author(s): Delbert R. Wigfall, John W. Foreman, Warwick A. Ames

The basic functions of the kidney are to maintain fluid and electrolyte homeostasis and metabolism. Renal disease requires the practitioner to be vigilant about fluid homeostasis, acid-base balance, electrolyte management, choice of anesthetics, and potential complications. This requires a thorough understanding of the excretory and fluid homeostatic functions of the kidney, particularly in the neonate and younger child. If not managed assiduously, perioperative renal dysfunction can deteriorate into renal failure or multiorgan system failure resulting in significant morbidity or mortality. The anesthesia provider must understand renal physiology, appropriate preoperative preparation, intraoperative management, and postoperative care of the child with renal disease.

29 General Abdominal and Urologic Surgery
24 mai 2018

Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children
End organ failure in children frequently ends in the need for organ transplantation. Improvements in surgical techniques coupled with advancements in the understanding of immunosuppression have increased patient survival and patient quality of life. This chapter deals with the anesthetic management of these challenging patients as well as describing morbidity and mortality statistics associated with these surgical procedures and underlying disease states.

Anesthesia for orthopedic and spine surgery provides a multitude of challenges. Children often present with concomitant diseases that affect cardiovascular and respiratory function. Operating times can be protracted, particularly for scoliosis surgery. Many of these procedures involve children already severely compromised by muscle weakness and impaired respiratory function. Improvement in monitoring of spinal cord function help minimize neurological risk. Significant blood loss can occur that requires strategies for blood product management and transfusion reduction. Major trauma causing orthopedic injuries invariably involves other organ systems that may adversely interact with or compromise anesthesia management. The risks of pulmonary aspiration of gastric contents and the requisite fasting times, after even minor trauma involving an isolated forearm fracture, continue to be debated. Fat embolus is uncommon in children with long-bone fractures but should be considered in any child with hypoxia and altered consciousness in the perioperative period. Tumor surgery may be complicated by chemotherapy, altered drug disposition, or bone grafting considerations akin to those for plastic and reconstructive surgery and complex postoperative pain management may be required. Positioning children on the operating table involves care, especially for those with limb deformities and contractures. Patients with a variety of syndromes also require other orthopedic procedures to assist in minimizing the impact of those syndromes on their quality of life. These syndromes present their own unique anesthetic challenges. The anesthesiologist’s role facilitating surgery and providing optimal postoperative care, particularly pain management, should not be underestimated.
Providing safe anesthesia for pediatric otolaryngological procedures requires complete understanding of the pathophysiology of the diseases being treated. Not only does the surgeon share the airway with the anesthesiologist, but the ability of the surgeon to safely and successfully complete the planned procedure depends on an airway that is well anesthetized (e.g., without coughing, laryngeal spasm or other reflex responses) and secure. Although it is the primary responsibility of the anesthesiologist to monitor the child’s vital signs, the surgeon needs to understand that in many situations the procedure may have to be interrupted to verify that ventilation and oxygenation are not compromised. Drugs administered during surgery, such as anti-emetics and opioids, may profoundly impact the course of the perioperative period. This chapter reviews all the common anesthetic related issues for children undergoing otolaryngological procedures with particular emphasis on children with obstructive sleep apnea, management of subglottic stenosis, diagnostic laryngoscopy and bronchoscopy, epiglottitis, laryngeal papillomatosis, tracheostomy, laryngeal reconstruction and others.

Anesthesia assessment, induction, maintenance and recovery may be complex for ophthalmology procedures. Not only is the ophthalmologic procedure a major consideration, but the concurrent medical conditions associated with the ophthalmologic disorder may hold implications for airway management and cardiorespiratory challenges. Premature infants often need anesthesia for all ophthalmologic procedures and complications of prematurity may manifest themselves. Careful planning and communication with the ophthalmologist increases the likelihood for an uncomplicated anesthetic and postoperative recovery period. We review the physiology and specific conditions that require careful consideration when planning anesthesia for these children.

Anesthesia assessment, induction, maintenance and recovery may be complex for ophthalmology procedures. Not only is the ophthalmologic procedure a major consideration, but the concurrent medical conditions associated with the ophthalmologic disorder may hold implications for airway management and cardiorespiratory challenges. Premature infants often need anesthesia for all ophthalmologic procedures and complications of prematurity may manifest themselves. Careful planning and communication with the ophthalmologist increases the likelihood for an uncomplicated anesthetic and postoperative recovery period. We review the physiology and specific conditions that require careful consideration when planning anesthesia for these children.
A wide variety of plastic surgical procedures are performed in infants and children of all ages. Children presenting for plastic surgery present with a specific set of management challenges that are determined by the surgical procedure performed (e.g., blood loss management in craniosynostosis surgery) and the associated comorbidities (e.g., difficult airway management for mandibular distraction surgery). An optimal and nuanced approach to management is facilitated by an understanding of both the procedures performed and underlying diseases. Presented in this chapter are a selection of key plastic/reconstructive procedures, associated diagnoses and their relevance to care, and management pearls.

36 Burn Injuries
24 mai 2018
Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children

Author(s): Erik S. Shank, Charles J. Coté, J.A. Jeevendra Martyn

Pediatric burn injuries present unique challenges to the anesthesiologist. These include alterations in physiology and pharmacology, as well as technical challenges with airway management, vascular access, pain management, and physiological monitoring. This chapter uses a systems approach to discuss the unique pathophysiology of the burn patient, the pharmacological alterations, and addresses some special circumstances including the management of inhalational injuries, electrical burns, carbon monoxide poisoning, and cyanide poisoning. Post-operative pain management, opioid sparing techniques, and regional anesthesia for the burn patient are also discussed.

37 The Extremely Premature Infant (Micropremie) and Common Neonatal Emergencies
24 mai 2018
Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children

Author(s): James P. Spaeth, Jennifer E. Lam

The preterm infant, defined as birth before 37 weeks gestation, provides unique medical and surgical challenges to health care providers due to a myriad of anatomical underdevelopments and physiologic derangements. The physiology of prematurity as it relates to anesthesia is of particular importance when preparing for surgery. Anatomic differences of the premature airway and altered respiratory mechanics, such as a smaller airway diameter, increased oxygen consumption, bronchopulmonary dysplasia and apnea place these infants at risk for rapid and profound desaturation and hypoventilation during anesthesia. The immature heart has not had time to develop sufficient muscle fibers for optimal contractility. In addition, persistent pulmonary hypertension of the newborn may develop when right-to-left shunting of blood occurs through a patent ductus arteriosus and/or a patent foramen ovale due to failure of the pulmonary vascular resistance to drop at birth. These factors may combine and lead to significant cardiovascular collapse during surgery. Premature infants are susceptible to metabolic derangements such as hypoglycemia and
Hypocalcemia due to improper storage and loss of maternal-fetal transfer during gestation. The liver and kidneys are underdeveloped, leading to altered drug metabolism, thus, anesthetic drugs must be tailored accordingly. Neonatal surgical emergencies, such as congenital diaphragmatic hernia, hypertrophic pyloric stenosis, necrotizing enterocolitis and gastrochisis, can present at any time and be life-threatening. Immediate surgical intervention is not always necessary and there is often time for medical optimization. Advances in neonatal care have improved the morbidity and mortality of critically ill newborns.

### 38 Fetal Intervention and the EXIT Procedure

24 mai 2018

**Publication date:** 2019

**Source:** A Practice of Anesthesia for Infants and Children

**Author(s):** Roland Brusseau

Fetal intervention allows surgical correction or amelioration of known congenital defects in utero. With improvements in prenatal imaging and surgical techniques, fetal interventions have grown to include diagnoses associated with intrauterine demise, as well as diseases associated with significant postnatal morbidity. The goal of fetal intervention is to improve the chances of normal fetal development and minimize postnatal morbidity. Increasingly, advances have changed some procedures from open in-utero interventions, which are associated with significant maternal risk, to percutaneous or fetoscopic techniques, thus improving the maternal risk-to-benefit ratio while diminishing postoperative uterine contractions associated with open procedures. Fetal surgery often requires the anesthesiologist to care for two or more patients at once, all with distinctive and, at times, conflicting requirements. The first is the mother who can express her level of discomfort, who can be monitored directly, and to whom drugs can be administered easily. The second (and possibly third) is the fetus. For the latter, detecting pain depends solely on indirect evidence, monitoring is limited at best, administering drugs is more complicated, and there is the possibility of long-term effects from procedures and drugs administered during early development. The anesthesiologist is required to provide both maternal and fetal anesthesia and analgesia while ensuring both maternal and fetal hemodynamic stability; a plan must be prepared to resuscitate the fetus if problems occur during the intervention.

### 39 Trauma

24 mai 2018

**Publication date:** 2019

**Source:** A Practice of Anesthesia for Infants and Children

**Author(s):** David A. Young, David E. Wesson

Traumatic injuries are the most common cause of death within the United States for children more than one year of age. Pediatric patients with traumatic injuries can vary in complexity ranging from an isolated foot fracture to a life-threaten traumatic brain injury requiring emergent surgery. Strategies of Advanced Trauma Life Support (ATLS) should be utilized in the perioperative setting to effectively care for pediatric trauma patients. These strategies include recognition of cardiopulmonary disorders, volume resuscitation, and prevention...
of additional injuries including to the cervical spine. Trauma patients may present hemodynamically unstable and with unclear circumstances. Patient information may be limited including important details such as past medical history, past surgical history, and drug allergies. Although the general principles of resuscitation for pediatric trauma patients are similar to those used for adults, effective management of the pediatric trauma patient also requires an appreciation of the anatomical, physiological, developmental, and emotional characteristics that differentiate children from adults. The management of pediatric trauma patients typically includes the involvement of a multidisciplinary team. Anesthesiologists comprise an important role within this team in many capacities. To deliver effective care to the pediatric trauma patient, anesthesiologists must become proficient with the initial evaluation and resuscitation of the pediatric trauma patient and continue this process throughout the perioperative period. Anesthesiologists, surgeons, and other personnel should work together as a synchronized team when managing children with traumatic injuries.

40 Cardiopulmonary Resuscitation

24 mai 2018
Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children
Author(s): Sandeep Gangadharan, Pooja Nawathe, Charles L. Schleien

Despite the increasing safety of anesthesia, perioperative cardiopulmonary resuscitation in infants and children remains a relatively common event. Successful resuscitation to spontaneous circulation requires early recognition and coordination of a team of practitioners to function effectively to deliver best practice CPR. Additionally, the perioperative and operative environment adds further challenges to delivery of effective CPR. Vigilance and following best evidence practice remain critical in the prevention and mitigation of critical events in the perioperative setting.

41 Malignant Hyperthermia

24 mai 2018
Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children
Author(s): Jerrold Lerman, Jerome Parness

Malignant hyperthermia (MH) is a pharmacogenetic disease that is the sole life-threatening disease triggered by inhaled anesthetics and succinylcholine. Identification of the signs and symptoms of an acute MH reaction (the first sign is an increased end-tidal carbon dioxide partial pressure) has been instrumental in establishing diagnostic tests and treatments. The caffeine-halothane contracture test remains the gold-standard test to diagnose MH against which the more recent genetic testing is compared. The primary mutation associated with MH to date is the ryanodine receptor defect on chromosome 19, which is an important gatekeeper for calcium release from the sarcoplasmic reticulum. Several other genetic mutations have also been associated with MH. The diminution in mortality from MH over the past several decades has been attributed to appreciating the signs of an acute MH reaction and the availability of dantrolene. The pharmacokinetics of dantrolene have been delineated in
children to guide treatment. MH has been associated with several muscle disorders (e.g., central core myopathy) and shares characteristics with others (e.g., heat stroke). Monitoring of those who develop MH reactions should continue until all signs of MH have abated. Preparation of AWSs for MHS patients includes replacing the carbon dioxide absorbent, airway breathing circuit and flushing the AWS while the ventilator is active for at least 10 minutes and most recently, insertion of charcoal filters in the breathing circuit. All patients who develop MH reactions should be counseled regarding muscle biopsy testing (if adults) and referred for a MedicAlert bracelet.

42 Regional Anesthesia

Regional anesthesia has become an integral and common component of both intraoperative anesthesia and postoperative analgesia in infants and children. Advantages of regional blockade include the reduction of general anesthetic dose requirements, effective blunting of hemodynamic and autonomic responses, and excellent postoperative analgesia with decreased requirement of systemic analgesics and their concomitant side effects. For many orthopedic operations, increasing use of peripheral nerve blockade permits the anesthesiologist to provide long durations of analgesia limited to the surgical site. Spinal anesthesia in infants has been demonstrated to be an effective alternative to general anesthesia for subumbilical operations lasting an hour or less. However, the risks of local anesthetic toxicity may be magnified in infants and children because of their size and immaturity, and great care and precision must be used when choosing volume and concentration. Because the vast majority of regional blocks in children are performed with patients under general anesthesia, early signs of toxicity are usually obscured. The emergence of lipid emulsion therapy for local anesthetic systemic toxicity has dramatically altered our approach and the successful outcome to these events and should be administered promptly. Large-scale prospective data from multicenter collaborative studies have documented that regional anesthetics in children have a high degree of safety, and prospective data have confirmed that administering blocks to children under general anesthesia confers no increased risk of injury. While one must have specific technical skills, as well as an understanding of the differences in pediatric physiology, anatomy, and pharmacology, to use regional blockade in infants and children, the benefits of these techniques are great.

43 Ultrasound-Guided Regional Anesthesia

Peripheral nerve blocks are frequently performed in children to provide anesthesia or analgesia during the perioperative period. Success depends on the ability to accurately place the needle—and thereby the local
anesthetic—close to the target nerve without causing injury to the nerve or adjacent structures. In the past, clinicians relied on anatomic landmarks, fascial clicks, loss of resistance, or nerve stimulation to position the needle in the vicinity of the nerve. Anatomic landmarks provide valuable clues to the position of the nerve, but they are surrogate markers, lack precision, vary among children of different ages, and may be difficult to locate in obese children. Even nerve stimulation, which has been recommended as the gold standard for nerve localization, may not always elicit a motor response and its use does not guarantee success or preclude complications. Moreover, the accuracy of needle placement cannot be predicted with any of these methods, which may lead to multiple attempts to place the needle that may result in pain and possibly an incomplete or failed nerve block. The use of ultrasound (US) to guide peripheral and central neuraxial blocks has improved both accuracy and safety in both adults and children. In this chapter, the basic principles of US imaging and the techniques of US-guided regional anesthesia (USGRA) in children are described and reviewed.

44 Acute Pain
24 mai 2018

The management of acute pain in children continues to evolve. Numerous observational and self-report assessment tools have been validated in children, but a complete assessment also includes information about adverse effects, sleep quality, and functional recovery. In cognitively-impaired children, information from caregivers can be extremely helpful in addition to specific assessment tools for these children. There are unique aspects of assessment and risk factors for opioid-related respiratory depression in these children, who will benefit from an individualized analgesic plan. Initial treatment of pain should use multimodal principles, including non-pharmacologic methods, such as distraction, and opioid-sparing analgesics. In most cases, scheduled administration of non-opioids (e.g., acetaminophen, NSAIDS) is recommended, with opioids given as needed for moderate to severe pain. In addition to standard oral and intravenous routes, opioids can also be delivered via patient-controlled analgesia in older children or by proxy (nurse or family member) in younger or cognitively-impaired children. Regional anesthesia techniques are another important part of a multimodal approach, and are particularly useful after major surgery. Epidural (or paravertebral) catheters are appropriate for major thoracic, abdominal or lower extremity operations. Peripheral approaches to the brachial plexus or femoral and sciatic nerves can be used for operations involving upper or lower extremities, and children can be discharged home with continuous peripheral catheters in place. Adjuvants such as clonidine or dexamethasone can be given to prolong the duration of the regional blockade.

45 Chronic Pain
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The management of chronic pain in children continues to evolve. Numerous observational and self-report assessment tools have been validated in children, but a complete assessment also includes information about adverse effects, sleep quality, and functional recovery. In cognitively-impaired children, information from caregivers can be extremely helpful in addition to specific assessment tools for these children. There are unique aspects of assessment and risk factors for opioid-related respiratory depression in these children, who will benefit from an individualized analgesic plan. Initial treatment of pain should use multimodal principles, including non-pharmacologic methods, such as distraction, and opioid-sparing analgesics. In most cases, scheduled administration of non-opioids (e.g., acetaminophen, NSAIDS) is recommended, with opioids given as needed for moderate to severe pain. In addition to standard oral and intravenous routes, opioids can also be delivered via patient-controlled analgesia in older children or by proxy (nurse or family member) in younger or cognitively-impaired children. Regional anesthesia techniques are another important part of a multimodal approach, and are particularly useful after major surgery. Epidural (or paravertebral) catheters are appropriate for major thoracic, abdominal or lower extremity operations. Peripheral approaches to the brachial plexus or femoral and sciatic nerves can be used for operations involving upper or lower extremities, and children can be discharged home with continuous peripheral catheters in place. Adjuvants such as clonidine or dexamethasone can be given to prolong the duration of the regional blockade.
Chronic pain is a sometimes debilitating problem for children and young adults. The emphasis in evaluation and treatment is based on a multidisciplinary care model. Anesthesiologists may be asked about advanced pharmacologic treatments, interventional techniques and may have to care for patients on chronic opioids or other pharmacotherapies. Further, anesthesia providers covering an acute pain service may receive consultation requests for patients having acute flare-ups of chronic pain. An understanding of the multi-team approach to management of these children is essential, as is also knowledge of disease processes, pain pharmacotherapy and complementary therapies.

46 Anesthesia Outside the Operating Room
24 mai 2018
Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children
Author(s): Joseph P. Cravero, Mary Landrigan-Ossar

Anesthesia outside the operating room for children is a critical aspect of the delivery of pediatric anesthesia. The very nature of children requires that anesthesia is provided for procedures and tests outside the operating room to an extent that far outstrips that needed for adult patients. The variety of practice environments involved in this care places a premium on the resourcefulness and flexibility of the anesthesiologist. The myriad of comorbid conditions that accompany these patients must be appreciated—particularly those that impact airway management as well as cardiac and pulmonary performance. Anesthesiologists should seek to create systems of care that provide an environment that allows maximum efficiency and safety for this patient population regardless of the location of anesthesia. These systems require appropriate personnel and equipment availability that allows care to be consistent with the standards of the operating room, including the management of difficult airways and cardiopulmonary arrest. Quality Improvement efforts must be specifically designed for anesthesia delivered outside the operating room and must be integrated with the departments that are partnered in this care. Finally, anesthesia outside the operating room has to be delivered by individuals with specific knowledge of the idiosyncrasies of each location in which care is delivered. The special precautions that must be taken in the magnetic environment of the MRI scanner, the peculiar sclerotic agents in the interventional radiology suite, and the risks associate with radiation therapy, must all be appreciated and considered in designing care plans in each of these important ancillary environments.

47 The Postanesthesia Care Unit and Beyond
24 mai 2018
Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children
Author(s): Andreas H. Taenzer, Jeana E. Havidich

A critical segment of the perioperative care of children is the transfer from the operating room to the staffed post anesthesia care unit (PACU). A well designed, fully equipped, and appropriately staffed PACU is essential for
providing high quality and safe care. This chapter emphasizes the importance of vigilant monitoring and discusses common occurring events, the perioperative environment, and strategies to provide optimal care for children in the postoperative period.

48 Sedation for Diagnostic and Therapeutic Procedures Outside the Operating Room

24 mai 2018
Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children

Author(s): Joseph P. Cravero, Richard F. Kaplan, Mary Landrigan-Ossar, Charles J. Côté

Sedation of children for tests and procedures represents a significant portion of the care that pediatric anesthesiologists provide. At the same time, other pediatric subspecialists also provide sedation services for which pediatric anesthesiologists provide back-up and oversight. The manner in which sedation is divided between anesthesiologists and other specialists is not consistent between institutions and must be decided based on patient need and the availability of individuals who are qualified to provide sedation. To aid in standardization, sedation guidelines have been promulgated by multiple organizations with the objective of bringing the same rigorous standards for evaluation, monitoring, documentation, and quality improvement to the practice of sedation that has characterized anesthesiology care. Sedation outcomes are generally improved when this care is provided in an organized system of care in which the sedation providers, administrators, nurses, and technical support have well understood protocols for scheduling cases, induction/maintenance of sedation, and recovery/discharge. The unique challenge of sedation lies in providing safe and effective service while working in a multitude of locations, each with unique challenges. Sedation providers must be aware of the requirements of each venue such as the pain and repeated procedures that characterize oncology procedures or the strong magnetic field of the MRI scanner. Care must be designed that meets the needs of the patient and the individual who is performing the procedure. In order to optimize sedation provision, an extensive knowledge of the pharmacokinetics and pharmacodynamics of the sedative and analgesic agents is critical.

49 Procedures for Vascular Access

24 mai 2018
Publication date: 2019
Source: A Practice of Anesthesia for Infants and Children

Author(s): Samuel H. Wald, Januelle Mendoza, Frederick G. Mihm, Charles J. Côté

This chapter describes the various common locations for venous access, central venous access and arterial catheter placement in infants and children. Possible complications associated with each approach are also delineated. Several intraosseous techniques are also illustrated. Videos of ultrasound guided access and many illustrations help the reader to understand best practices.
Historically the funding focus in the developing world has been on primary healthcare and infectious diseases. Access to safe surgery and safe anesthesia has recently been identified as a global health issue. Anesthesia remains a forgotten specialty. The challenges facing an anesthesiologist include lack of adequate training—many anesthetics are provided by nonphysicians—understaffing, poorly maintained equipment, outdated drugs and unreliable water, oxygen and electrical supplies. Children often present with comorbidities or complications of the surgical disease challenging the anesthesiologist. This chapter offers suggestions to prepare the anesthesiologist to meet these challenges.

This chapter covers the spectrum of equipment used to provide anesthesia to children safely. Specifically, advantages and disadvantages of devices for warming the child, maintaining temperature, intravenous catheter types and issues, fluid and blood warming devices, airway adjuncts (laryngeal mask airways, oral airways, and nasal trumpets), equipment for intubation, anesthesia workstations, waste gas scavenging, humidification systems, capnography (both sidestream and mainstream), pulse oximetry (and oximetry engineering approaches to improve accuracy and additional information such as hemoglobin estimate or the presence of abnormal hemoglobins [e.g., carboxyhemoglobin]), reflectance oximetry and near-infrared spectroscopy, neuromuscular blockade monitors, processed EEG monitors (bispectral index, entropy, and others, particularly in infants and young children), as well as a detailed assessment of a multitude of continuous and intermittent cardiac output measurement devices are discussed. The noninvasive continuous cardiac output devices are likely to be standard of care in the near future. When purchasing new equipment, it is vital that the equipment is tested in the environment where it will be used and by the practitioners intended to use it.
The field of pediatric anesthesia has become increasingly subspecialized, with unique challenges that demand high-quality teaching and training. Pediatric anesthesia is focused in detail, diverse in surgical and technical complexity, and tolerates an exceedingly small margin for error. With the growth and increased sophistication of pediatric anesthesia, as well as the regionalization of specialty care, anesthesiologists are continually challenged to gain and maintain expertise in the safe and effective delivery of routine and emergency pediatric anesthesia. Simulation-based education provides an experiential learning paradigm for opportunities to improve medical knowledge, technical skills, communication, and decision-making skills for common as well as rare events. In addition, simulation education provides opportunities to assess systems-based problems, improve interdisciplinary team training, ease relocation into facilities, and help adapt to new equipment and technology. Within the past decade, there has been rapid progress and growth of simulation in health care training for purposes of improving patient safety and quality of care. Given that crises in pediatric anesthesia are relatively rare and unpredictable and that anesthesia residents and faculty are expected to be able to successfully manage these situations, simulation-based education can fill these important knowledge gaps. In this chapter, we review how simulation education is applied in pediatric anesthesiology by describing its uses for learning and training in residency and fellowship programs, and its applications to improve patient safety and patient care.
3 Aesthetic Applications for Fillers

The pharmacokinetics (PK) and pharmacodynamics (PD) of most medications in children especially neonates, differ from those in adults. Children exhibit different PK and PD from adults because of their immature renal and hepatic function, different body composition, altered protein binding, distinct disease spectrum, diverse behavior, and dissimilar receptor patterns. PK differences necessitate modification of the dose and the interval between doses to achieve the desired concentration associated with a clinical response and to avoid toxicity. In addition, some medications may displace bilirubin from its protein binding sites and possibly predispose to kernicterus in premature neonates. Drug effect may be influenced by altered capacity of the end organ, such as the heart or bronchial smooth muscle, to respond to medications in children compared with adults. In this chapter we discuss basic pharmacologic principles as they relate to drugs commonly used by anesthesiologists.
14 The Pediatric Airway

This chapter reviews the developmental anatomy and physiology of the pediatric upper airway as it relates to the practice of pediatric anesthesia. Differences between the pediatric and adult airways are important determinants of anesthetic techniques. Knowledge of normal developmental anatomy and physiologic function is required to understand and manage both the normal and the pathologic airways of infants and children. Techniques of mask ventilation, oral and nasal airway placement, use of supraglottic devices, and tracheal intubation are reviewed for normal and anatomically abnormal pediatric patients.

16 Essentials of Cardiology

Congenital heart disease (CHD) is the most common birth defect affecting approximately 1% of live births. Although CHD is the leading cause of neonatal mortality, advances over the last several decades including significant contributions related to anesthesia care, now allow for survival of most affected infants. The wide spectrum of congenital cardiovascular anomalies and the various types of acquired heart disease in the pediatric age group presents a challenge to the clinician who does not specialize in the care of these children. Even for those with a focus or interest in cardiovascular disease, the range of structural defects, myocardial disorders, and other conditions, and the varied associated hemodynamic perturbations can be overwhelming. The ability to provide optimal perioperative care to affected children heavily relies on a clear understanding of the basic pathophysiology of the congenital anomalies and acquired diseases, familiarity with the commonly used diagnostic modalities in cardiology and their clinical applications, and medical and surgical treatment options available to affected individuals. In this chapter, we present essential concepts in cardiology to enhance the overall knowledge of the practicing anesthesiologist in pediatric cardiovascular disease.

32 Orthopedic and Spine Surgery

Anesthesia for orthopedic and spine surgery provides a multitude of challenges. Children often present with concomitant diseases that affect cardiovascular and
respiratory function. Operating times can be protracted, particularly for scoliosis surgery. Many of these procedures involve children already severely compromised by muscle weakness and impaired respiratory function. Improvement in monitoring of spinal cord function help minimize neurological risk. Significant blood loss can occur that requires strategies for blood product management and transfusion reduction. Major trauma causing orthopedic injuries invariably involves other organ systems that may adversely interact with or compromise anesthesia management. The risks of pulmonary aspiration of gastric contents and the requisite fasting times, after even minor trauma involving an isolated forearm fracture, continue to be debated. Fat embolus is uncommon in children with long-bone fractures but should be considered in any child with hypoxia and altered consciousness in the perioperative period. Tumor surgery may be complicated by chemotherapy, altered drug disposition, or bone grafting considerations akin to those for plastic and reconstructive surgery and complex postoperative pain management may be required. Positioning children on the operating table involves care, especially for those with limb deformities and contractures. Patients with a variety of syndromes also require other orthopedic procedures to assist in minimizing the impact of those syndromes on their quality of life. These syndromes present their own unique anesthetic challenges. The anesthesiologist’s role facilitating surgery and providing optimal postoperative care, particularly pain management, should not be underestimated.

41 Malignant Hyperthermia

Malignant hyperthermia (MH) is a pharmacogenetic disease that is the sole life-threatening disease triggered by inhaled anesthetics and succinylcholine. Identification of the signs and symptoms of an acute MH reaction (the first sign is an increased end-tidal carbon dioxide partial pressure) has been instrumental in establishing diagnostic tests and treatments. The caffeine-halothane contracture test remains the gold-standard test to diagnose MH against which the more recent genetic testing is compared. The primary mutation associated with MH to date is the ryanodine receptor defect on chromosome 19, which is an important gatekeeper for calcium release from the sarcoplasmic reticulum. Several other genetic mutations have also been associated with MH. The diminution in mortality from MH over the past several decades has been attributed to appreciating the signs of an acute MH reaction and the availability of dantrolene. The pharmacokinetics of dantrolene have been delineated in children to guide treatment. MH has been associated with several muscle disorders (e.g., central core myopathy) and shares characteristics with others (e.g., heat stroke). Monitoring of those who develop MH reactions should continue until all signs of MH have abated. Preparation of AWSs for MHS patients includes replacing the carbon dioxide absorbent, airway breathing circuit and flushing the AWS while the ventilator is active for at least 10 minutes and most recently, insertion of charcoal filters in the breathing circuit. All patients who develop MH reactions should be counseled regarding muscle biopsy testing (if adults) and referred for a MedicAlert bracelet.
Peripheral nerve blocks are frequently performed in children to provide anesthesia or analgesia during the perioperative period. Success depends on the ability to accurately place the needle—and thereby the local anesthetic—close to the target nerve without causing injury to the nerve or adjacent structures. In the past, clinicians relied on anatomic landmarks, fascial clicks, loss of resistance, or nerve stimulation to position the needle in the vicinity of the nerve. Anatomic landmarks provide valuable clues to the position of the nerve, but they are surrogate markers, lack precision, vary among children of different ages, and may be difficult to locate in obese children. Even nerve stimulation, which has been recommended as the gold standard for nerve localization, may not always elicit a motor response and its use does not guarantee success or preclude complications. Moreover, the accuracy of needle placement cannot be predicted with any of these methods, which may lead to multiple attempts to place the needle that may result in pain and possibly an incomplete or failed nerve block. The use of ultrasound (US) to guide peripheral and central neuraxial blocks has improved both accuracy and safety in both adults and children. In this chapter, the basic principles of US imaging and the techniques of US-guided regional anesthesia (USGRA) in children are described and reviewed.

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Orthoses are either custom made by the orthotist or they are generic devices fabricated in a range of sizes. The techniques used to produce traditional metal and leather orthoses and thermoplastic orthoses have not changed. What has changed is where these devices are fabricated and whether they are custom made for the individual patient or mass-produced generic devices, which are either modified to fit the patient or simply placed on the patient. Because of the advancements in both data collection and software development, computer-aided design (CAD) and computer-aided manufacturing (CAM), including additive manufacturing (3D printing), for orthoses has increased. Despite numerous advances in materials and fabrication techniques, the most critical element in the creation of a well-fitted, highly functional orthosis remains the clinical judgment and technical skill of the orthotist treating the patient.

4 Principles of Normal and Pathologic Gait

Human gait is a complex phenomenon that involves intricate interactions between the pelvis, hips, knees, and ankles. The goal of normal human ambulation is to facilitate travel from one location to another while minimizing effort and maintaining adequate stability across a wide variety of walking conditions. This is made possible by complex interactions between central and peripheral neural pathways coordinating movement of the musculoskeletal system. Understanding human gait requires a solid knowledge of underlying physiology and biomechanical principles. Observational gait analysis skills are essential in the evaluation and management of gait deviations seen in individuals with disabling conditions. Comprehending the relationship between clinical examination findings, biomechanical influences, and gait pattern observations serves as the foundation for the appropriate prescription and fitting of lower limb orthoses.

5 Biomechanics of the Spine

Human gait is a complex phenomenon that involves intricate interactions between the pelvis, hips, knees, and ankles. The goal of normal human ambulation is to facilitate travel from one location to another while minimizing effort and maintaining adequate stability across a wide variety of walking conditions. This is made possible by complex interactions between central and peripheral neural pathways coordinating movement of the musculoskeletal system. Understanding human gait requires a solid knowledge of underlying physiology and biomechanical principles. Observational gait analysis skills are essential in the evaluation and management of gait deviations seen in individuals with disabling conditions. Comprehending the relationship between clinical examination findings, biomechanical influences, and gait pattern observations serves as the foundation for the appropriate prescription and fitting of lower limb orthoses.

6 Principles and Components of Spinal Orthoses

Human gait is a complex phenomenon that involves intricate interactions between the pelvis, hips, knees, and ankles. The goal of normal human ambulation is to facilitate travel from one location to another while minimizing effort and maintaining adequate stability across a wide variety of walking conditions. This is made possible by complex interactions between central and peripheral neural pathways coordinating movement of the musculoskeletal system. Understanding human gait requires a solid knowledge of underlying physiology and biomechanical principles. Observational gait analysis skills are essential in the evaluation and management of gait deviations seen in individuals with disabling conditions. Comprehending the relationship between clinical examination findings, biomechanical influences, and gait pattern observations serves as the foundation for the appropriate prescription and fitting of lower limb orthoses.
Numerous orthotic devices are available for the treatment of spinal injury or instability. Custom devices are required for patients with atypical dimensions or significant bony prominences, where the intimacy of fit is best accommodated by custom-molded contours. Custom contours are especially indicated when high corrective forces are applied through the device for the treatment of spinal deformities such as scoliosis. In cases of spinal injury, general immobilization is required across the involved segment(s) of the spine. Typically, this patient population presents with relatively “normal” contours of the spine and torso before injury. In cases of spinal injury, the acute nature of the injury necessitates rapid treatment. Internal spinal fixation techniques have advanced significantly, and in some cases, these enhanced techniques preclude the need for additional external stabilization. In response to these developments, several manufacturers now provide reasonably priced prefabricated devices that are functionally equivalent to custom designs. However, these devices differ in material selection and durability. The choice of a prefabricated device is often mediated by physician preference. Regardless of the device selected for treatment of the spine, the choice of a custom or prefabricated orthosis will be determined by the level(s) of injury and the amount of stabilization required and must be determined on a case-by-case basis. It is important that a complete, clear, and acceptable plan is created by a multidisciplinary treatment team and that the treatment plan reflects the patient's goals, guided by the treatments team's expertise.

9 Orthoses for Spinal Trauma and Postoperative Care

The primary goal of a spinal orthotic is to increase spinal stability in all anatomical planes to support immobilization. Secondary goals include limiting progression of deformity and providing stability for healing. When determining a treatment plan after spinal trauma, the team must first define spinal stability to determine the risk of neurologic compromise. For some stable vertebral fractures, nonoperative treatment may be a reasonable alternative to surgery, achieving comparable long-term results as the use of spinal orthotics. For an unstable fracture requiring surgical intervention, spinal orthotics can be considered in the postoperative phase. The scientific evidence regarding whether spinal orthotics should be used after a spinal trauma and postoperative care varies widely based on the anatomical location of the injury, fracture type, stability, mechanism of injury, intended outcome, and individual comorbidity.

15 Orthoses for the Burned Hand

The primary goal of a spinal orthotic is to increase spinal stability in all anatomical planes to support immobilization. Secondary goals include limiting progression of deformity and providing stability for healing. When determining a treatment plan after spinal trauma, the team must first define spinal stability to determine the risk of neurologic compromise. For some stable vertebral fractures, nonoperative treatment may be a reasonable alternative to surgery, achieving comparable long-term results as the use of spinal orthotics. For an unstable fracture requiring surgical intervention, spinal orthotics can be considered in the postoperative phase. The scientific evidence regarding whether spinal orthotics should be used after a spinal trauma and postoperative care varies widely based on the anatomical location of the injury, fracture type, stability, mechanism of injury, intended outcome, and individual comorbidity.
Rehabilitation of a burned hand is challenging, and successful rehabilitation begins early after the acute injury. In general, scar contractures are the primary cause of deformities in the burned hand. Failure to address them early will lead to permanent joint and ligament contractures. Treatment of these deformities is much more difficult than preventing them. Proper splinting and edema control are the mainstays of early rehabilitative efforts. Initiation of range-of-motion (ROM) exercises is based upon the severity of injury and an assessment of the relative risks of tendon rupture and benefits derived by exercise. After the acute period, treatment consists of continued compliance with therapy, appropriate splinting, and use of compression garments to prevent contraction and hypertrophic scars. Prevention of deformity and restoration of optimal hand function must be the principal goals of rehabilitative efforts.

16 Orthotic Treatment Considerations for Arthritis and Overuse Syndromes in the Upper Limb

24 mai 2018
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Source: Atlas of Orthoses and Assistive Devices
Author(s): Christopher Hovorka, Daniel Acker

The chapter reviews the basic pathophysiology, pathomechanics, and orthotic treatment considerations of persons with arthritis and overuse syndromes involving the upper limb. The most common forms of arthritis (rheumatoid arthritis and osteoarthritis) and most common forms of overuse syndromes (lateral epicondylitis, cubital tunnel syndrome, carpal tunnel syndrome, de Quervain tenosynovitis, trigger finger [stenosing tenosynovitis]) are reviewed. Each of the pathologic conditions and diagnoses are reviewed by anatomical level (elbow, wrist, hand, thumb, fingers) and magnitude of deformity (mild, moderate, and severe). Using this framework, the orthotic treatment considerations are then presented in a practical and clinically relevant manner to guide the busy practitioner in making evidence-based decisions. Topics covered include orthosis design considerations (i.e., force systems, biomechanical motion controls, limb alignment, limb–orthosis interface dynamics and fitting principles) that are critical to enabling the patient with highly disabling conditions to achieve desired functional goals.

Introduction

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Publication date: 2019
Source: Atlas of Orthoses and Assistive Devices
Author(s): Douglas P. Murphy
Total joint arthroplasty is one of the most common surgical interventions in orthopedics. For patients with disabling arthritis of the hip or knee, joint replacement typically results in significant improvement in mobility and quality of life. Though orthoses are not typically used after primary total joint arthroplasty, bracing is sometimes necessary to preemptively support the joint when nerve blocks are used for anesthesia or after complicated primary or revision surgeries. More commonly, orthoses are used in the management of postoperative complications such as dislocation. This chapter discusses the common indications for use of an orthosis in total joint arthroplasty surgery.

Injuries to various structures of the knee joint, including the ligaments, menisci, and patellofemoral components, compose a significant portion of sports-related injuries seen by health care providers and compromise a patient's knee joint function and stability. Knee orthoses have been used in each step of the sport performance process, such as injury minimization, ligament rehabilitation after reconstruction, and treatment of functional instability of the knee joint. The knee joint allows for flexion and extension with some degree of translation and axial rotation. Shear forces act upon the knee during gait and in weight-bearing tasks. Proper functioning of knee braces must take into account these biomechanical factors. Both prefabricated (“off-the-shelf”) and custom-made knee brace designs have proven effective, and each has benefits with cost, fit, weight, and material components. More recently, braces have been manufactured with composite lightweight materials, such as carbon fiber and aluminum. Athletes have used knee orthoses both to prevent medial collateral ligament (MCL) and anterior cruciate ligament (ACL) injury and to protect ACL-deficient knees or an ACL-reconstructed graft while returning to full activity. Knee braces have become an important component in functional rehabilitation programs for treatment of MCL sprains. Acute grade I and II posterior cruciate ligament (PCL) tears have been shown to heal with bracing,
protected weight bearing, and quadriceps muscle rehabilitation. Braces are now used in osteoarthritis to enhance function and reduce pain.

26 Orthotic Management of Neuropathic and Dysvascular Feet

Neuropathic and dysvascular feet can present challenges to the treating orthopedic surgeon and should be managed by a multidisciplinary team focusing on patient education and prevention of injury. The most common pathology revolves around diabetic complications and development of the Charcot neuropathic joint. Neuropathic ulcers need to be prevented with diligent care, because ulceration is prognostic for amputation in these patients. The goal of treatment for these patients is to maintain a viable limb that can support weight bearing and ambulation with an off-the-shelf orthosis. The first stage of treatment for neuropathic ulceration typically consists of a total contact cast, which allows off-loading of the affected area to promote wound healing. Once healing has started, the patient can be transitioned to off-loading orthotics such as an orthotic dynamic splint or, classically, the Charcot Restraint Orthotic Walker (CROW). After wounds are completely healed, future injuries can be prevented with appropriately fitting shoewear and accommodative inserts. Ulcers and wounds caused by venous vascular disease may benefit from treatment with compressive stockings, whereas wounds caused by arterial deficiency require consultation with a vascular surgeon for appropriate treatment.

27 Orthotic Management of Polio and Postpolio Syndrome

Postpolio syndrome (PPS) presents a challenge in management for both health care providers and orthotists. Although polio has effectively been eradicated in the developed world as a result of vaccination, PPS is a late and debilitating sequela of the acute viral infection. A diagnosis of exclusion, PPS presents with onset of new weakness after at least 15 years of functional and neurologic stability and leads to a flaccid paralysis while maintaining intact sensation and proprioception. In this group of individuals, fatigue is often the most common complaint, even with minimal exertion. These patients will often compensate well for their debility and may sometimes find it difficult to accept a new assistive device. To date, no medications have been found to be significantly beneficial in the management of polio or PPS. Optimization of cardiorespiratory function and proper orthotic management are both essential in the management of PPS. Patients are best treated with an individualized, multidisciplinary rehabilitation approach following a customized medical and functional evaluation to address the unique deficits of each individual with polio or PPS. Many different orthotics are available to aid in the management of PPS, but for
them to be effective, they must be used by the patient. Therefore before the fitting process is initiated, it is crucial to discuss and understand the goals and expectations of the patient when using an orthosis or AD to improve compliance and avoid setting unrealistic expectations.

28 Lower Limb Orthoses for Persons Who Have Had a Stroke
24 mai 2018
Publication date: 2019
Source: Atlas of Orthoses and Assistive Devices

Author(s): Joan Hou, Benjamin D. Fortson, William Lovegreen, John R. Fox

Lower limb orthoses are a useful part of the rehabilitative effort for an individual who has suffered a stroke. Orthotic treatments should be based on clearly identified objectives and the unique physical examination of each patient for best chance of success. Off-the-shelf orthoses have some value, particularly when a patient's strength and range of motion are likely to change in the future, but custom orthoses offer the most options for control or accommodation of a lower limb. Current research is interesting, but there remain many areas for investigation, particularly in formation of treatment guidelines, validation of outcome measures, and analysis of biomechanical effects of orthotic intervention.

31 Pediatric Hip Orthoses
24 mai 2018
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Source: Atlas of Orthoses and Assistive Devices

Author(s): Shannon M. Kelly, Seth K. Stubblefield, Laura L. Tosi

33 Orthoses for Cerebral Palsy
24 mai 2018
Publication date: 2019
Source: Atlas of Orthoses and Assistive Devices

Author(s): Tom F. Novacheck, Gary Kroll, Aaron Rasmussen
43 Neuromuscular Electrical Stimulation Applications

24 mai 2018

Publication date: 2019

Source: Atlas of Orthoses and Assistive Devices

Author(s): Jayme S. Knutson, Nathaniel S. Makowski, Kevin L. Kilgore, John C h a e

Neuromuscular electrical stimulation (NMES) of paralyzed muscles can be used to restore or replace motor function in individuals who have upper motor neuron damage from causes such as stroke or spinal cord injury (SCI). In some conditions, such as stroke or incomplete SCI, NMES may be part of a therapy regimen that helps restore volitional movement and function. In other conditions, such as severe stroke or complete SCI, permanent NMES applications are needed to replace the lost neuromuscular function. This chapter describes NMES devices for upper and lower extremity therapeutic and neuroprosthetic applications.

44 Exoskeletal Assisted Rehabilitation After Spinal Cord Injury

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Source: Atlas of Orthoses and Assistive Devices

Author(s): Ashraf S. Gorgey, Ryan Sumrell, Lance L. Goetz

This chapter reviews recent technologic advances to counteract the immobility and negative comorbidities that are associated with the lack of ambulation after spinal cord injury (SCI). A historical background of the progression of robotics in the medical field is reviewed to describe their evolution in rehabilitation medicine. Exoskeletal devices are a new robotic technology that has the potential to revolutionize therapeutic exercise after SCI. Different brands of exoskeletons have been introduced for rehabilitation and community ambulation with different designs and features. The use of exoskeletons may ameliorate several of the chronic health-related consequences that are likely to affect persons with SCI. Existing research is limited but suggests some health benefits of exoskeletons, including improvements in gait function, body composition, aerobic capacity, bone density, spasticity, bowel function, and quality of life. Clinical trials are underway to confirm these benefits and determine the underlying mechanisms that lead to such improvements. Maximizing the application of robotics in rehabilitation environments may be accomplished by providing hybrid protocols with other established techniques such as exercise, gait training, and functional electrical stimulation (FES). Future recommendations may include using FES and brain computer interfaces in conjunction with an exoskeleton to improve rehabilitation outcomes and quality of life after SCI. Further research is warranted to demonstrate the health and quality-of-life benefits of robotic exoskeletons in outpatient and home settings.

45 Future Trends and Research in Orthoses

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Source: Atlas of Orthoses and Assistive Devices
Endoscopes are flexible instruments that combine fiber-optics and charge-coupled devices to facilitate illumination and visualization of otherwise inaccessible sites, such as the lumen of hollow organs. An endoscope consists of a tip, an insertion tube and a control section. Newer endoscopes are capable of providing high-definition, high-resolution images that can be magnified to examine the mucosa in greater detail. Image-enhancing modalities can be used to selectively highlight vascular structures or enhance the appearance of the mucosa. The most commonly used endoscopes are gastroscopes and colonoscopes, which are used for examination of the upper gastrointestinal tract and colon, respectively. Therapeutic endoscopes with larger channel diameters that allow passage of complex and sophisticated accessories are also available for advanced interventional procedures. Specialized endoscopes can be used to inspect the small bowel (enteroscopes, capsule endoscopes), biliary and pancreatic ductal systems (duodenoscopes, choledochoscopes), as well as the extra-luminal anatomy (echoendoscopes). These devices are used for a wide array of applications including assessment of the mucosa of the gastrointestinal tract, visualization and resection of polyps, management of gastrointestinal bleeding, obtaining tissue samples of extra-luminal organs, and screening for pre-malignant conditions. This chapter describes the design and types of endoscopes, its image-processing capabilities, and the various accessories now being used in clinical practice.
Variceal bleeding is one of the most severe complications of liver cirrhosis. When cirrhosis is diagnosed, varices are present in approximately 30% to 40% of compensated patients and in 60% of those who present with ascites. Once varices have been diagnosed, the overall incidence of variceal bleeding is 25% within two years. Variceal size is the most useful predictor for variceal bleeding; other predictors being the severity of liver dysfunction (Child-Pugh classification) and the presence of red wale marks on the variceal wall. When a patient presents with acute variceal bleeding, appropriate management with initial general measures such as resuscitation (airway, breathing, and circulation), a restrictive transfusion policy, antibiotic prophylaxis, pharmacological therapy with vasoconstrictors, and endoscopic therapy with endoscopic band ligation is mandatory. After bleeding has been controlled, combination therapy with nonselective β-blockers (NSBBs) and endoscopic band ligation should be used to prevent rebleeding. In patients at high risk of treatment failure identified early after admission, the placement of a preemptive TIPS (transjugular intrahepatic portosystemic shunt) improves control of bleeding, prevents rebleeding, reduces mortality, and should be the treatment of choice if no contraindications are present. When initial endoscopic therapy fails, rescue therapies such as Sengstaken-Blakemore tubes and fully covered self-expandable esophageal metal stents may be required as a bridge toward the definitive treatment with TIPS. Regarding gastric variceal bleeding, data is limited. In acute cardiofundal variceal bleeding, vasoactive agents, together with cyanoacrylate (CYA) injection, seem to be the treatment of choice. Further CA injections and/or NSBB may be used to prevent rebleeding. TIPS, or balloon-occluded retrograde transvenous obliteration when TIPS is contraindicated, may be used as a rescue therapy.

Zenker's diverticulum (ZD) is an outpouching of tissue through Killian's triangle thought to be due to cricopharyngeal muscle dysfunction. This relatively uncommon disorder, which occurs more commonly in the elderly, presents with symptoms of dysphagia. Videofluoroscopy confirms the diagnosis. Therapy of symptomatic ZD has evolved from an open surgical approach to transoral endoscopic techniques. Transoral endoscopic therapy includes the rigid approach performed primarily by otorhinolaryngologists and the flexible approach performed by surgical endoscopists and gastroenterologists. The common goal of all treatments is dividing the septum between the esophageal lumen and the diverticular lumen. Each approach has variations in techniques, as well as advantages and disadvantages. In this chapter, we will outline the pathophysiology and management of patients with Zenker's diverticula, with an emphasis on flexible endoscopic therapy.
There have been significant advances in our understanding of the mechanisms that drive the inflammatory and remodeling consequences of eosinophilic esophagitis (EoE). We have learned that standardizing definitions has helped clinicians and researchers define adequate therapeutic goals, allowing for a common language to be spoken among physicians. Although not a part of the diagnostic criteria, endoscopic findings play a critical role in the global assessment of disease severity, and are often the first clue to a physician that a patient has EoE. Moreover, initial severity of endoscopic findings has important clinical implications with regard to treatment options, including the need for dilations and predicting the effectiveness of medical therapies. Finally, given the discord between patient-reported symptoms and histologic outcomes, endoscopic features may serve as a more reliable therapeutic marker. Therefore, a comprehensive assessment of a patient's symptoms, histology, and endoscopic findings is critical in ascertaining a global assessment of a patient's disease phenotype to determine an adequate treatment plan.

Colonic strictures present an interesting clinical and technical challenge to the gastrointestinal endoscopist. Endoscopic diagnosis and therapy can contribute meaningfully to the care of patients with benign and malignant strictures with a reasonable risk profile. Endoscopic dilation of benign strictures can help patients avoid the morbidity associated with operative resection. For patients with malignant strictures, endoscopic placement of self-expanding metal stents can offer palliation of obstruction at the end of life or, in select patients, serve as a bridge to a safer, less morbid surgery. The role of the gastrointestinal endoscopist in the diagnosis and management of colonic strictures is sure to evolve as endoscopic techniques are refined and as new technologies and medical therapies are developed.

Nutrition support teams depend on the skills of an endoscopist to deliver enteral tube feeding, especially when certain medical or surgical conditions require deep jejunal access. The need for short-term feeding (less than four weeks in duration) can be met by placement of a nasoenteric tube, but if longer periods of feeding are anticipated, a percutaneous device should be utilized. Mastering
the many techniques described for achieving enteral access allows the endoscopist to adjust to the varying clinical scenarios and anatomic variations that may be encountered in general practice. Techniques which involve untethered endoscopy or placement of the tube over a guidewire are preferred over those which require dragging the tube itself down through in the gastrointestinal tract with the endoscope. Attention should be paid to securing the tube post placement. As the nutritional therapy is delivered, patients should be monitored for tolerance of their feeding regimen and the enteral access site should be examined regularly to avoid complications. Careful vigilance allows the identification of early problems, affords the opportunity for quick solutions, and avoids the more serious complications requiring endoscopic or even surgical intervention.

51 Endoscopic Ultrasound and Fine-Needle Aspiration for Pancreatic and Biliary Disorders

Endoscopic ultrasound (EUS) is a powerful technique that is integral to the management of many patients with biliary and pancreatic disease. EUS provides detailed images of the extrahepatic biliary tree and pancreas with very little risk to the patient, and is useful in the evaluation of obstructive jaundice, biliary or pancreatic ductal dilation, pancreatic masses, and pancreatitis. EUS and endoscopic retrograde cholangiopancreatography (ERCP) can be performed during the same sedation session, with EUS identifying patients likely to benefit from therapeutic ERCP. EUS-guided therapeutic interventions have an evolving role in selected patients, including celiac plexus interventions, fiducial placement, drainage of pancreas fluid collections, and EUS-guided drainage of inaccessible biliary and pancreatic ducts. EUS is an increasingly important tool for the biliary and pancreatic endoscopist. This chapter reviews the technique of pancreaticobiliary EUS and discusses its role in selected diagnoses.

60 The Indeterminate Biliary Stricture

Indeterminate biliary strictures, defined as biliary strictures with no obvious mass on imaging, that cannot be distinguished as malignant or benign despite initial endoscopic retrograde cholangiopancreatography (ERCP) and standard sampling methods, remain a challenge for pancreaticobiliary endoscopists. Advances in laboratory evaluation such as tumor markers and microRNAs may serve as complementary tools for diagnosing malignancies such as cholangiocarcinoma. Advances in imaging such as cholangioscopy, confocal endomicroscopy and optical coherence tomography may also help with optimizing identification of tissue to be targeted for biopsy. And lastly, advances in tissue sampling, such as combination sampling, molecular analysis,
specimen presentation, and on-site analysis, may further improve accuracy in the evaluation of indeterminate biliary strictures.

62 Evaluation and Staging of Pancreaticobiliary Malignancy

Endoscopic ultrasound (EUS) permits the most detailed nonoperative view of the pancreas and extrahepatic biliary system that is available. This facilitates the detection of malignant pancreaticobiliary lesions at an early stage before such lesions become detectable by conventional cross-sectional imaging like computed tomography (CT) or magnetic resonance (MR). The tissue acquisition (TA) capabilities of EUS add a substantial depth to its clinical applications, providing a safe and accurate method to confirm various types of pancreaticobiliary pathologies prior to initiation of therapy. EUS continues to play an important role in the care of pancreaticobiliary malignancies by triaging patients to operative or non-operative care largely due to its ability to detect early metastasis and vascular invasion. Recently, EUS provided a solid platform for a variety of novel tissue and imaging-based technologies that can help render better-quality care to this group of patients. This chapter summarizes the role of EUS for the evaluation of solid malignant pancreatic and biliary neoplasms.

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Systemic lupus erythematosus (SLE) is an autoimmune disease characterized by systemic inflammation and the production of numerous autoantibodies, many of which are directed to nuclear antigens. The disease exhibits female predominance and is more common in individuals of African or Asian descent.
than in Caucasians. Although the precise etiology is not known, it is clear that both genetic predisposition and environmental triggers are factors. Approximately 50 risk alleles have been identified, yet severity and age of onset of disease relate only partially to the number of risk alleles present in an individual. Years before clinical symptomatology and diagnosis, immune perturbations of both myeloid cells and B cells can be identified. Progression from immune perturbation to clinical disease can occur through multiple mechanisms, possibly related to genetic factors, and can account for the variability in clinical presentation and disease course. Evidence from patients and from mouse models of disease suggests that most tissue injury is initiated by autoantibody deposition, with subsequent activation of myeloid cells through Fc receptor–mediated mechanisms. This, in turn, leads to altered function in tissue resident cells. Nucleic acid containing immune complexes can lead to systemic inflammation through activation of endosomal Toll-like receptors. The impetus for the production of autoantibodies, and in particular antibodies to nuclear antigens, is not known; however, it is thought to be secondary in some individuals to impaired mechanisms for the clearance of apoptotic debris, and in others it is perhaps secondary to cross-reactivity with microbial antigens. Numerous organ systems can be affected by SLE. Skin and musculoskeletal manifestations are most common. Neuropsychiatric manifestations, especially cognitive impairment, are increasing and appreciated as a component of disease. Mortality in SLE is due primarily to active disease—most commonly nephritis—to accelerated atherosclerosis, and to infection secondary to immunosuppressive treatment regimens. At present, treatment strategies are globally immunosuppressive and are inadequate, with limited efficacy and potentially devastating toxicities. A number of clinical trials of novel biologicals in SLE have been unsuccessful, suggesting the need for better understanding of pathogenic mechanisms and better mouse models of disease.

52 Rheumatoid Arthritis

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Source: Clinical Immunology

Author(s): Andrew P. Cope

Rheumatoid arthritis (RA) is a chronic, immune-mediated inflammatory disease with features of systemic autoimmunity. Although the initial trigger for disease initiation remains elusive, great strides have been made toward an understanding of its complex etiopathogenesis. Notable among these have been the identification of more than 100 genetic variants associated with susceptibility and an appreciation that the dominant autoimmune response targets neoantigenic epitopes generated through posttranslational modifications, together with confirmation that disease-associated autoantigens are recognized by both T- and B-cell antigen receptors. The development of biological therapies for the treatment of RA has been transformative, with major impacts on the treatment of a wide range of immune-mediated inflammatory diseases. Finally, recognition of the preclinical phase of the disease provides opportunities for novel interventions, with prospects for cure.

53 Juvenile Idiopathic Arthritis

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About 1 in 1000 children in the United States develops chronic arthritis, mostly juvenile idiopathic arthritis (JIA). There are many types of JIA, including JIA involving a few joints (oligoarticular) or many joints (polyarticular, both rheumatoid factor negative and positive subsets); psoriasis-related; enthesitis-related; and systemic. Several comorbid conditions may exist in children with JIA, including eye inflammation (uveitis), destructive temporomandibular joint (TMJ) arthritis, and macrophage activation syndrome (MAS), the last occurring primarily in those with systemic JIA. Fortunately, frequent screening of children with JIA by ophthalmologists, combined with improved uveitis therapeutics, has resulted in a dramatic reduction in cases of blindness resulting from uveitis. Similarly, TMJ arthritis is detectable by magnetic resonance image screening prior to symptoms. The advent of biological therapies targeting proinflammatory cytokines (tumor necrosis factor [TNF], interleukin-1 [IL-1], IL-6) has markedly improved outcomes of all forms of JIA and MAS. Early and aggressive therapy can result in normal childhoods for children with JIA.

Systemic sclerosis is an orphan disease of unknown cause and complex pathogenesis. Multiple genetic variants that are common to systemic lupus, and other autoimmune diseases have been identified. Autoimmunity and fibrosis are prominent features of the disease. Systemic sclerosis predominantly affects women, follows a chronic and unpredictable course with multiple organs affected, and lacks effective disease-modifying therapies. In addition to variable degree of skin involvement and Raynaud phenomenon, interstitial lung disease, widespread microvascular disease, intestinal tract pathology, and cardiovascular complications are common. Late-stage disease is usually accompanied by ischemic digital ulcers, pulmonary artery hypertension, pulmonary fibrosis, and small bowel dysfunction. The diffuse cutaneous form of the disease is associated with increased mortality. Although there are no approved disease-modifying therapies, carefully tailored and individualized management of specific organ-based complications can be highly effective in improving quality of life, reducing complications, and improving outcomes.

Spondyloarthritis (SpA) comprises a group of diseases characterized by axial,
entheseal, and peripheral joint inflammation in the setting of overlapping nonmusculoskeletal inflammatory manifestations (skin, eye, and gut) and a tendency toward familial aggregation. Typically, autoantibodies are not formed in patients with SpA. The group of diseases includes ankylosing spondylitis (AS), reactive arthritis, psoriatic arthritis, enteropathic arthritis, and "undifferentiated spondyloarthritis." Susceptibility to SpA has a strong genetic component. In addition to human leukocyte antigen (HLA)-B27, 70 genes have been identified for AS, 60 for psoriasis/psoriatic arthritis, and 130 for inflammatory bowel disease. Some susceptibility genes are involved in the T-helper 17 (Th17) and antigen-processing/-presenting pathways. The development of new classification criteria and of advances in imaging allow for earlier diagnosis. Striking advances have also occurred with treatment, with the introduction of biological therapies, such as anti–tumor necrosis factor (TNF) and interleukin-17 (IL-17) therapies.

59 Large-Vessel Vasculitides

Large-vessel vasculitides (LVVs) include giant-cell arteritis (GCA), Takayasu arteritis (TA), and polymyalgia rheumatic (PMR). Dendritic cells (DCs), T cells, and macrophages, arranged in transmural infiltrates in medium and large arteries, cause the vascular pathology. Vascular GCA is now recognized as a chronic and persistent lesion, which is characterized by a defect in the inhibitory programmed death 1 (PD-1) immune checkpoint. Extravascular GCA results from innate immune activation and an intense hepatic acute phase response. Emerging data suggest partial autonomy of vascular and extravascular disease with respect to pathogenesis, course, and therapeutic responsiveness. A newly described immune aging signature implicates a defect in CD8 regulatory T cells (Tregs) in controlling the overall size and activity of the CD4 T-cell compartment. Tissue biopsy remains the single most valuable diagnostic procedure. Many patients require chronic immunosuppression. Noninvasive imaging modalities are critically important in monitoring for disease progression. With the advent of new biologicals blocking cytokine function and costimulatory signals, the therapeutic armamentarium is broadening, but efficacy in suppressing vascular lesions remains unresolved.

70 Autoimmune Thyroid Diseases

Autoimmune thyroid disorders are common, and, indeed, as a group, they are the most prevalent autoimmune disorders in humans. Despite many common underlying features, such as a marked female preponderance, shared susceptibility alleles, and common autoantigens, Graves disease and autoimmune hypothyroidism have contrasting clinical characteristics. Over recent years, our knowledge about the underlying pathogenesis has increased...
as a result of advances in human genomics, molecular immunology, and the availability of murine models of disease. Novel therapies based on this increased understanding are now emerging.

Glucocorticoids (GCs) are very useful antiinflammatory drugs and are prescribed for a wide range of medical conditions, especially rheumatic disorders. GCs have several modes of action that come into play at different dosages. At low to moderate doses, genomic effects predominate. GCs bind to cytosolic receptors and are translocated into the nucleus where they interact with GC-response elements and transcription factors that control the synthesis of a wide range of proteins. The beneficial effects of GCs on inflammation largely result from inhibition of transcription factors (transrepression), and the adverse side effects of GCs are mainly caused by induction of regulatory proteins (transactivation). GCs also act through posttranscriptional and posttranslational mechanisms. At higher doses, nongenomic actions become relevant. These include inhibition of arachidonic acid release and effects on endothelial nitric acid synthase. At very high doses, nonspecific effects on biological membranes occur, which may contribute to the efficacy of ultra-high-dose regimes. GCs inhibit cytokine production and, conversely, proinflammatory cytokines, such as interleukin-1 (IL-1) and tumor necrosis factor- (TNF-), can modulate intracellular GC metabolism. This may contribute to the nonlinear dose–response curve for stimulation and suppression of inflammation by GCs. At daily doses of 30mg prednisone or equivalent, 50–90% of GC receptors (GCRs) are saturated. Higher doses lead to complete receptor saturation but have significantly greater adverse effects, so they should only be used for inducing remission during life-threatening disease flare-ups. Very high doses (prednisone above 100mg/day) are sometimes used for pulse therapy and may confer additional benefit as a result of the nongenomic effects. Once control is achieved, gradual reduction is appropriate while maintaining control. Osteoporosis is the most important complication of long-term glucocorticoid (GC) therapy. Bone protection is mandatory for anyone on long-term systemic steroids. Other important adverse effects include myopathy, hypertension, psychosis, skin thinning and bruising, and increased risk of infection. Gastric irritation and ulceration can occur, but GCs are less prone to this side effect compared with nonsteroidal antiinflammatory drugs (NSAIDs). Adverse effects on glucose metabolism can induce or destabilize diabetes mellitus. Future prospects for GC development include selective GC receptor antagonists that predominantly induce transrepression with reduced transactivation. Nitrosteroids combine the antiinflammatory properties of GCs with low-level release of nitric oxide (NO), which may induce regulatory T cells (Tregs). Other lines of research include liposomal encapsulation, modified release preparations, and combinations of GC with dipyridamole. GCs remain a valuable tool in fighting inflammatory and immunological disease; further improvements in their risk–benefit ratio will likely emerge over the next decade, keeping them at the forefront of the immunologist’s armamentarium.
Chapter 6 Constitutive relations and formulation of classical linear theories of solids and fluids

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Source: Continuum Mechanics Modeling of Material Behavior

Author(s): Martin H. Sadd

Chapters 6–9 will explore numerous types of constitutive equations for a broad class of materials commonly found in engineering and scientific applications. Constitutive relations characterize a continuum material's macroscopic response to applied mechanical, thermal, or other types of loadings. Such relations are often based on the material's internal constitution and commonly result in idealized material models such as elastic solids or viscous fluids. These models do not come directly from general principles, but rather are normally developed from observed behaviors found in collected experimental data. As shown in Fig. 1.5, we also wish to combine various constitutive laws with our previous kinematical, stress, and general principle relations in order to create a closed system of field equations that contains sufficient numbers of relations to solve for all model unknowns (see discussion in Section 5.8 and Table 5.1).

Chapter 7 Constitutive relations and formulation of theories involving multiple constitutive fields

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Source: Continuum Mechanics Modeling of Material Behavior

Author(s): Martin H. Sadd

Chapter 6 presented several of the common classical constitutive laws for solids and fluids. This discussion was limited to linear mechanical theories that only included the continuum fields of displacement, strain, and stress and also their time derivatives. This set of continuum fields may be regarded as a common or fundamental set upon which more general and complicated material theories are built. It should be apparent that many aspects of material behavior may also involve thermal, electrical, magnetic, aging, component mixtures, and other effects. Such behaviors are commonly found in piezoelectric materials, magnetorheological fluids, shape memory solids, electroactive polymers, biological, and porous materials. These materials then couple additional field behaviors with the standard displacement–strain–stress fields. The purpose of this chapter is to explore such additional behaviors and present three of the more common continuum theories that model some of these situations. Our basic approach is to present how these additional fields are properly included and to review a few solved example problems within each theory to see how the model predictions are developed and used.

LES PARUTIONS SUR SCIENCE DIRECT. MOT CLÉ "EMG"
Anesthesia for orthopedic and spine surgery provides a multitude of challenges. Children often present with concomitant diseases that affect cardiovascular and respiratory function. Operating times can be protracted, particularly for scoliosis surgery. Many of these procedures involve children already severely compromised by muscle weakness and impaired respiratory function. Improvement in monitoring of spinal cord function help minimize neurological risk. Significant blood loss can occur that requires strategies for blood product management and transfusion reduction. Major trauma causing orthopedic injuries invariably involves other organ systems that may adversely interact with or compromise anesthesia management. The risks of pulmonary aspiration of gastric contents and the requisite fasting times, after even minor trauma involving an isolated forearm fracture, continue to be debated. Fat embolus is uncommon in children with long-bone fractures but should be considered in any child with hypoxia and altered consciousness in the perioperative period. Tumor surgery may be complicated by chemotherapy, altered drug disposition, or bone grafting considerations akin to those for plastic and reconstructive surgery and complex postoperative pain management may be required. Positioning children on the operating table involves care, especially for those with limb deformities and contractures. Patients with a variety of syndromes also require other orthopedic procedures to assist in minimizing the impact of those syndromes on their quality of life. These syndromes present their own unique anesthetic challenges. The anesthesiologist’s role facilitating surgery and providing optimal postoperative care, particularly pain management, should not be underestimated.

Chronic pain is a sometimes debilitating problem for children and young adults. The emphasis in evaluation and treatment is based on a multidisciplinary care model. Anesthesiologists may be asked about advanced pharmacologic treatments, interventional techniques and may have to care for patients on chronic opioids or other pharmacotherapies. Further, anesthesia providers covering an acute pain service may receive consultation requests for patients having acute flare-ups of chronic pain. An understanding of the multi-team approach to management of these children is essential, as is also knowledge of disease processes, pain pharmacotherapy and complementary therapies.
Stroke and brain injury are often complicated by the development of upper motor neuron syndrome. Most spontaneous motor recovery occurs within 6 months of stroke and traumatic brain injury. Combining the therapeutic interventions of oral antispasmodics, therapy, casting, bracing, and targeted chemodenervation is a first-line measure. Definitive surgical procedures to reduce spasticity are effective and include neurectomies, tendon releases, and transfers. It is important to treat the underlying spasticity to use orthoses effectively. The prolonged period of spontaneous neurologic recovery is complicated by spasticity (resistance to quick stretch), rigidity (resistance to slow stretch), impairment of motor control, synergistic patterns of movement, synkinesis (involuntary associated movement in a distant limb segment), and immobility. Orthotic selection heavily depends on the patient's realistic functional goals as well as the severity, type, and distribution of joint range of motion impairment. It is a compromise of immobilization versus function meant to restore normative biomechanics to the upper limb.

Orthotics and assistive devices are commonly used in the management of individuals with a spinal cord injury (SCI) or brachial plexus injury (BPI) and provide functional benefits to users. Although orthotic interventions are a common and widely accepted clinical practice, minimal research data exist to support their effectiveness. As with the entire rehabilitation process after SCI and BPI, no one therapy technique or orthotic intervention should stand alone. Orthoses, stretching and strengthening programs, medications, and surgical options should all be considered during both the acute and chronic phases of rehabilitation.

The chapter reviews the basic pathophysiology, pathomechanics, and orthotic treatment considerations of persons with arthritis and overuse syndromes involving the upper limb. The most common forms of arthritis (rheumatoid arthritis and osteoarthritis) and most common forms of overuse syndromes (lateral epicondylitis, cubital tunnel syndrome, carpal tunnel syndrome, de...
Quervain tenosynovitis, trigger finger [stenosing tenosynovitis]) are reviewed. Each of the pathologic conditions and diagnoses are reviewed by anatomical level (elbow, wrist, hand, thumb, fingers) and magnitude of deformity (mild, moderate, and severe). Using this framework, the orthotic treatment considerations are then presented in a practical and clinically relevant manner to guide the busy practitioner in making evidence-based decisions. Topics covered include orthosis design considerations (i.e., force systems, biomechanical motion controls, limb alignment, limb–orthosis interface dynamics and fitting principles) that are critical to enabling the patient with highly disabling conditions to achieve desired functional goals.

27 Orthotic Management of Polio and Postpolio Syndrome

Postpolio syndrome (PPS) presents a challenge in management for both health care providers and orthotists. Although polio has effectively been eradicated in the developed world as a result of vaccination, PPS is a late and debilitating sequela of the acute viral infection. A diagnosis of exclusion, PPS presents with onset of new weakness after at least 15 years of functional and neurologic stability and leads to a flaccid paralysis while maintaining intact sensation and proprioception. In this group of individuals, fatigue is often the most common complaint, even with minimal exertion. These patients will often compensate well for their debility and may sometimes find it difficult to accept a new assistive device. To date, no medications have been found to be significantly beneficial in the management of polio or PPS. Optimization of cardiorespiratory function and proper orthotic management are both essential in the management of PPS. Patients are best treated with an individualized, multidisciplinary rehabilitation approach following a customized medical and functional evaluation to address the unique deficits of each individual with polio or PPS. Many different orthotics are available to aid in the management of PPS, but for them to be effective, they must be used by the patient. Therefore before the fitting process is initiated, it is crucial to discuss and understand the goals and expectations of the patient when using an orthosis or AD to improve compliance and avoid setting unrealistic expectations.

29 Assessment and Orthotic Management of Gait Dysfunction in Individuals With Traumatic Brain Injury

Many different orthotics are available to aid in the management of PPS, but for them to be effective, they must be used by the patient. Therefore before the fitting process is initiated, it is crucial to discuss and understand the goals and expectations of the patient when using an orthosis or AD to improve compliance and avoid setting unrealistic expectations.
Assistive technology (AT) is a generic term that includes assistive, adaptive, and rehabilitative devices for people with disabilities and includes the process used in selecting, locating, and using them. This chapter reviews the AT evaluation process that includes the interdisciplinary team determination of the appropriateness of, selection of, and training for an AT device. Through the evaluation process, AT practitioners use the Human Activity Assistive Technology (HAAT) Model to assess the human factors, activities of participation, and the context (environment) in which the individual will use the technology. The AT field covers a wide range of strategies and devices; this chapter focuses on two areas of AT: (1) alternative and augmentative and alternative communication (AAC) devices and (2) the electronic aids to daily living (EADLs). Factors that determine the selection of an AAC and EADL device and the types of devices available are explored. In addition, critical points in the selection process such as access, mounting, and the integration of the technology are explored. Finally, funding sources and the future of AT in the field of AACs and EADLs are identified.

Neuromuscular electrical stimulation (NMES) of paralyzed muscles can be used to restore or replace motor function in individuals who have upper motor neuron damage from causes such as stroke or spinal cord injury (SCI). In some conditions, such as stroke or incomplete SCI, NMES may be part of a therapy regimen that helps restore volitional movement and function. In other conditions, such as severe stroke or complete SCI, permanent NMES
applications are needed to replace the lost neuromuscular function. This chapter describes NMES devices for upper and lower extremity therapeutic and neuroprosthetic applications.

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55 Scleroderma–Systemic Sclerosis
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Source: Clinical Immunology
Author(s): John Varga, Fredrick M. Wigley

Systemic sclerosis is an orphan disease of unknown cause and complex pathogenesis. Multiple genetic variants that are common to systemic lupus, and other autoimmune diseases have been identified. Autoimmunity and fibrosis are prominent features of the disease. Systemic sclerosis predominantly affects women, follows a chronic and unpredictable course with multiple organs affected, and lacks effective disease-modifying therapies. In addition to variable degree of skin involvement and Raynaud phenomenon, interstitial lung disease, widespread microvascular disease, intestinal tract pathology, and cardiovascular complications are common. Late-stage disease is usually accompanied by ischemic digital ulcers, pulmonary artery hypertension, pulmonary fibrosis, and small bowel dysfunction. The diffuse cutaneous form of the disease is associated with increased mortality. Although there are no approved disease-modifying therapies, carefully tailored and individualized management of specific organ-based complications can be highly effective in improving quality of life, reducing complications, and improving outcomes.

56 Inflammatory Muscle Diseases
24 mai 2018
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Source: Clinical Immunology
Author(s): Arash H. Lahouti, Lisa Christopher-Stine

The idiopathic inflammatory myopathies (IIMs) are a group of rare systemic diseases. They consist of polymyositis (PM), dermatomyositis (DM), inclusion body myositis (IBM), and more recently described immune-mediated necrotizing
myopathy. Traditionally, they are believed to be autoimmune diseases, although recent studies suggest that there is a close resemblance between IBM and other neurodegenerative diseases. Similar to other autoimmune diseases, patients with IIM often have autoantibodies in their serum. Some of these antibodies are specific for myositis and are not seen in other rheumatic disorders. Our knowledge of the myositis-specific antibodies is not comprehensive. Over the past few years, there has been considerable effort to better characterize antibodies associated with myositis, and new antibodies are being discovered constantly. Each myositis-specific antibody is closely linked to a unique clinical phenotype. Thus these antibodies are useful in classifying the IIMs. They can forewarn physicians of particular extramuscular manifestations and guide them toward initiating appropriate treatments. The IIMs present with muscle weakness and elevated muscle enzymes. In patients with DM, skin manifestations may be the initial presentation. The differential diagnosis of the IIMs is broad and includes drug-induced myopathies, neuromuscular disorders, muscular dystrophies, and metabolic and endocrine myopathies. To add to the complexity of the classification, some DM patients do not develop muscle weakness, referred to as clinically amyopathic DM. The age and gender of the patient, the pattern of the weakness, the severity of the manifestations, and the associated symptoms usually aid in suspecting the correct diagnosis. For example, IBM is distinguished from other IIMs by a characteristic involvement of the finger flexor and knee extensor muscles, which is often asymmetrical. IBM is more common in older men, whereas PM and DM are commonly seen in young to middle-aged women and children. Dermatomyositis is often associated with characteristic skin findings, which are not a feature of PM and IBM. However, differentiation between the IIMs cannot be made on clinical grounds in a substantial number of patients, and further diagnostic testing is required. For example, both PM and immune-mediated necrotizing myopathy present in a same fashion with a predominant symmetrical proximal muscle weakness and elevated muscle enzymes. They can be distinguished only by pathological examination. On muscle biopsy, immune-mediated necrotizing myopathy is associated with necrosis and regeneration of muscle fibers and a characteristic sparse inflammatory infiltrate. In contrast, PM is associated with the presence of cytotoxic inflammatory cells surrounding and invading muscle fibers. Electromyography is a valuable tool for differentiating between weakness originating from muscle rather than peripheral nerves. Magnetic resonance imaging (MRI) can be extremely helpful to identify inflammatory changes in patients with subtle clinical muscle involvement. Moreover, MRI can help to better estimate the burden of the disease and differentiate acute changes (edema) from chronic changes (atrophy). The role of new imaging modalities such as whole-body MRI needs to be further investigated. Interstitial lung disease, gastrointestinal involvement, and arthritis are among the most common extramuscular manifestations of the IIMs. Interstitial lung disease commonly occurs as part of the antisynthetase syndrome in a subset of patients who have antisynthetase autoantibodies. Gastrointestinal manifestations include dysphagia and aspiration pneumonia. Dysphagia is particularly common and can be seen in all forms of the IIM. In addition, certain forms of the IIMs, particularly DM, can be a paraneoplastic phenomenon. The most common cancers associated with myositis include gynecological (ovarian), pulmonary, gastrointestinal (pancreatic, stomach, and colorectal), and non-Hodgkin lymphoma. Also, the IIMs may be associated with other autoimmune diseases such as systemic lupus erythematosus, Sjögren syndrome, and systemic sclerosis. Muscle biopsy is critical for the diagnosis of IIMs. The presence of perifascicular atrophy is strongly suggestive of DM, whereas the finding of rimmed vacuoles in the appropriate context suggests IBM. Muscle biopsy may also help differentiate between the IIMs and other forms of myopathy presenting as myositis clinical mimics such as drug-induced myopathies and muscular dystrophies. Treatment of the IIMs is based largely on experience. Corticosteroids remain the mainstay of treatment. Steroid-sparing agents such as azathioprine, methotrexate, mycophenolate mofetil, and hydroxychloroquine are frequently initiated at presentation while a steroid taper is attempted. In patients with refractory disease, rituximab, intravenous immunoglobulin, and biological medications may be tried. Inclusion body myositis is the most resistant subset of the IIMs.
Myasthenia Gravis

24 mai 2018

Publication date: 2019

Source: Clinical Immunology

Author(s): Arnold I. Levinson

Myasthenia gravis (MG) is an autoimmune disease characterized by weakness of striated muscles. The weakness is caused by impaired neuromuscular transmission resulting from a reduction in the number of receptors for the neuromuscular type of nicotinic acetylcholine receptor (nAChR) at the postsynaptic myoneural junction. In most cases, this reduction is the result of the action of IgG antibodies directed at the subunit of the nAChR. However, it is now appreciated that additional autoantibodies may be found in the presence and absence of anti-AChR antibodies, some of which have associated pathogenic activity. Most of these react with other components of the muscle endplate. Several subtypes of MG are recognized based on their clinical presentation, age of onset of MG, and associated autoantibody specificities.

The diagnosis of MG can usually be confirmed by pharmacological and electrophysiological testing, along with identification of anti-AChR antibodies or one of the other less commonly associated muscle-specific autoantibodies. Considerable knowledge concerning the immunopathogenesis of MG has been garnered from studies of an experimental model of MG, experimental autoimmune MG (EAMG). These studies have highlighted the potential roles of a number of immunoregulatory disturbances that are linked to a bevy of associated genetic risk factors. However, this model falls short in recapitulating a major clinical pathological feature of its human counterpart; that is, thymic pathology is absent. Indeed, thymic pathology is a frequent feature of human MG with 65–75% of patients with anti-AChR antibodies presenting with thymic hyperplasia/germinal center formation and another 10% of patients with thymoma. In addition, it is generally accepted that thymectomy leads to clinical improvement. Accordingly, for years considerable attention has been focused on the mechanisms by which thymic events occurring in genetically predisposed individuals might lead to the development of MG. Although this important issue remains to be clarified, it is likely, at least in the patients with thymic hyperplasia, that an antecedent inflammatory reaction in the thymic medulla leads to a breach in immunological tolerance with spillover of the autoimmune response to skeletal muscle. Therapy typically entails the use of drugs that directly target the abnormal neuromuscular transmission and immunomodulatory agents and procedures that target the pathogenic immune responses.

Sarcoidosis

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Source: Clinical Immunology

Author(s): Edward S. Chen, David R. Moller

Sarcoidosis is a systemic inflammatory disorder characterized by noncaseating granulomas and CD4 lymphocyte inflammation in affected tissues. The disease most frequently involves lungs and thoracic lymph nodes, although any organ system may be involved. The manifestations and clinical course of sarcoidosis vary greatly. There is a genetic predisposition for sarcoidosis risk and course that predominantly involves major histocompatibility complex (MHC)–associated
genes. Immunological features include polarized T-helper 1 (Th1) and Th17 immunity at sites of inflammation associated with deficient regulatory T-cell (Treg) responses. There is evidence for microbial triggers in the etiology of sarcoidosis but a lack of consensus on the ensuing pathogenic pathways. A diagnosis of sarcoidosis is best established by the presence of compatible clinical features, consistent biopsy results, and the exclusion of other causes of granulomatous inflammation. More than one-third of patients experience chronic, progressive manifestations requiring maintenance suppressive therapy. Corticosteroid therapy remains the cornerstone of treatment. Steroid-sparing therapies are often used, although their role remains uncertain.
motor, or proprioceptive systems that jointly contribute to the acquisition of motor milestones. With a careful history and appropriate vestibular and balance testing, it is frequently possible to identify the likely cause of the balance disorder, even in the most complex patients.

Chapter 4 Assessment Techniques for Vestibular Evaluation in Pediatric Patients

24 mai 2018
Publication date: 2019
Source: Dizziness and Vertigo Across the Lifespan

Author(s): L. Maureen Valente

The study of vestibular disorders in children has gained popularity over recent years. This chapter thoroughly describes the adaptation of adult techniques so that pediatric patients may be successfully evaluated. Assessment tools include strategies that may be implemented more informally during the medical/physical examination and more formal evaluative techniques, including videooculography, rotary chair, computerized dynamic posturography, vestibular evoked myogenic potentials, and others. It is crucial that the clinician obtains pediatric normative data, as opposed to comparing pediatric evaluative results with adult normative data. As with hearing impairment, the earlier a vestibular disorder is identified, the earlier the necessary remediation strategies may begin.

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24 mai 2018
Publication date: 2019
Source: Fundamentals of Cognitive Neuroscience
**Advances in multi-sensor fusion for body sensor networks: Algorithms, architectures, and applications**

24 mai 2018  
Publication date: January 2019  
Source: Information Fusion, Volume 45

Author(s): Giancarlo Fortino, Hassan Ghasemzadeh, Raffaele Gravina, Peter X. Liu, Carmen C.Y. Poon, Zhelong Wang

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**81 Disorders of Breathing During Sleep**

24 mai 2018  
Publication date: 2019  
Source: Kendig’s Disorders of the Respiratory Tract in Children

Author(s): David Gozal, Leila Kheirandish-Gozal

This chapter reviews pertinent mechanisms related to the maturation of respiratory control and upper airway function and then proceeds to describe several frequent conditions associated with sleep-disordered breathing, as well as unique diseases leading to breathing perturbations during sleep that provide insights on pathophysiology and clinical manifestations of these disorders.

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**Procedure 20 Mini-Open Biceps Tenodesis**

24 mai 2018  
Publication date: 2019  
Source: Operative Techniques: Shoulder and Elbow Surgery

Author(s): Andrew S. Neviaser, Robert J. Neviaser

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**Procedure 37 Open and Arthroscopic Suprascapular Nerve Decompression**

24 mai 2018  
Publication date: 2019  
Source: Operative Techniques: Shoulder and Elbow Surgery

Author(s): Aydin Budeyri, Sumant G. Krishnan
Suprascapular nerve decompression is an important entity that is quite uncommon but may often be neglected. Physical examination, imaging techniques, and electromyographic studies are the keys to a successful diagnosis, treatment, and outcomes. With the help of contributions from the recent literature, current management and treatment techniques for suprascapular nerve compression are covered in this chapter.

Procedure 41 Nerve Transfers for Shoulder and Elbow Restoration After Upper Trunk Brachial Plexus Injuries

24 mai 2018
Publication date: 2019
Source: Operative Techniques: Shoulder and Elbow Surgery
Author(s): Christopher J. Dy, Scott W. Wolfe

Procedure 43 Suprascapular Nerve Neuropathy

24 mai 2018
Publication date: 2019
Source: Operative Techniques: Shoulder and Elbow Surgery
Author(s): Brandon J. Erickson, Anthony A. Romeo

Although not a common cause of shoulder dysfunction in patients, entrapment of the suprascapular nerve can become a debilitating problem, specifically in the overhead athlete population. As this problem is somewhat rare, it can be difficult to diagnose on initial presentation and is often missed. The suprascapular nerve can be injured secondary to repetitive traction injury, trauma, and compression, often by cystic lesions. The nerve is specifically vulnerable to injury at two points along its course: the suprascapular notch and spinoglenoid notch. Entrapment of the suprascapular nerve typically occurs in patients between the ages of 20 and 50 years, is more common in men than women, and has a reported incidence of 1%–2% in the general population in patients who present with shoulder pain. There are several athletic populations that are at risk for suprascapular nerve entrapment, including swimmers, volleyball players, tennis players, and baseball players, with baseball pitchers and volleyball players at the highest risk for injury. Unless a large cystic lesion is seen compressing the suprascapular nerve on magnetic resonance imaging (MRI), nonoperative management is typically the initial treatment of choice. In patients who fail a course of nonoperative treatment, operative decompression can provide excellent results when performed well.

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24 mai 2018
Chapter 14 Disorders of Consciousness

24 mai 2018

Author(s): Sunil Kothari, Ekua Gilbert-Baffoe, Katherine A. O'Brien

This chapter reviews issues central to the rehabilitation of persons with a disorder of consciousness (DoC). After a discussion of the nomenclature and taxonomy of DoC, the bulk of the chapter is focused on the assessment and treatment of these patients. An emphasis is placed on the issues and modalities that are directly relevant to clinicians practicing in this field. However, newer approaches and technologies are briefly introduced so that clinicians will be aware of them. There are also brief discussions of epidemiology, outcomes, ethical issues, and systems of care.

Chapter 17 Neuroprosthetics

24 mai 2018

Author(s): Sheital Bavishi, Joseph Rosenthal, Marcia Bockbrader

A neuroprosthetic is any device that can enhance the input or output of a neural system. Although some neuroprosthetics, such as cochlear implants and visual prosthetics, have been around since the 1950s, they are just beginning to emerge as viable interventions in the field of brain injury. Neuroprosthetics encompass a variety of artificial devices or systems that can be used to enhance the motor, sensory, cognitive, visual, auditory, and communicative deficits that arise from acquired brain injuries. These include assistive technology, functional electrical stimulation, myoelectric prostheses, robotics, virtual reality gaming, and brain stimulation. Neuromodulation consists of extracranial stimulation devices such as transcranial direct current stimulation and transcranial magnetic stimulation or implanted devices such as brain-computer interfaces and deep brain stimulators. The objective of neuroprosthetics is to allow brain-injured people to participate in everyday life and enhance the quality of life.
Integrating independent dispatchable and non-dispatchable resources into a micro-grid platform enables the main power systems to benefit from the economic and environmental advantages of distributed generation while facilitating local, clean, and inexhaustible renewable energy production. Moreover, it makes the integrated components more visible and controllable for the whole power system. On the other hand, to properly handle multiple uncertainties inherent in the micro-grids, probabilistic energy management techniques are deployed. However, utilization of stochastic modeling and optimization tools for efficient, reliable, and cost-effective planning, operation, and control of micro-grids remains an open issue. In this paper, the optimal offering of a low voltage renewable micro-grid in the energy and reserve markets is investigated. The energy and reserve prices are assumed to be uncertain; therefore, lognormal probability density function is used to model energy and reserve price uncertainties, and the Latin Hypercube Sampling method is applied to generate appropriate prices. In addition, a bi-level stochastic programming approach is utilized to optimize the resultant large size MINLP model through the combination of AlphaECP and LindoGlobal solvers in GAMS. The value of stochastic solution is also evaluated to indicate the accuracy of the stochastic solutions.

Re-thinking floor mat design from an ergonomics perspective: Can a two-part mat system reduce biomechanical loads during normal mat handling tasks?

Floor mats are commonplace in commercial buildings, particularly in entry ways. These mats are routinely handled by delivery personnel as the mats are picked up for cleaning and clean mats are deployed. A new two-part mat design, which eliminates the need to move the rubber base during mat change operations, was hypothesized to reduce the physical demands on delivery personnel. Electromyographic data from back and shoulder muscles and spinal kinematics were obtained as 12 volunteers simulated mat selection, mat deployment, and mat pick-up tasks. Other factors considered in this study included mat size, pick-up method, and mat textile orientation during deployment. Results indicated that the two-part design reduced muscle activation levels across all tasks. Biomechanical benefits were also found when the mats were picked-up using a kick-fold as opposed to hand-fold method and when mats were deployed with the textile component rolled towards the inside of the roll.
This review addresses the possible structural and functional adaptations of the muscle function to neuromuscular electrical stimulation (NMES) training in frail and/or aged (without advanced chronic disease) subjects. Evidence suggests that the sarcopenic process and its structural and functional effects would be limited and/or reversed through NMES training using excito-motor currents (or direct currents). From a structural viewpoint, NMES helps reduce muscle atrophy. From a functional viewpoint, NMES enables the improvement of motor output (i.e., muscle strength), gait, balance and activities of daily living which enhances the quality of life of aged subjects. Muscle plasticity of aged subjects in response to NMES training turns out to be undeniable, although many mechanisms are not yet explained and deserve to be explore further. Mechanistic explanations as well as conceptual models are proposed to explain how muscle plasticity operates in aged subjects through NMES training. NMES could be seen as a clinically applicable training technique, safe and efficient among aged subjects and could be used more often as part of prevention of sarcopenia. Therapists and physical conditioners/trainers could exploit this new knowledge in their professional practice to improve life conditions (including the risk of fall) of frail and/or aged subjects.

Effects of unexpected visual motion on postural sway and motion sickness

Motion sickness is thought to occur when the brain’s assumptions about incoming sensory information do not match the actual signals received. These signals must involve the vestibular system for motion sickness to occur. In this paper, we describe an experiment in which subjects experienced unexpected visual motions, or perturbations, as they navigated a virtual environment (VE) while standing and wearing a head mounted display (HMD) or while viewing a monitor. We found that postural instability, as measured by a balance board, increased with time only when perturbations were present. HMD users exhibited greater sway when exposed to visual perturbations than did monitor users. Yet motion sickness increased only when an HMD was used and occurred with or without participants undergoing perturbations. These results suggest that the postural instability which is generated by unexpected visual perturbation does not necessarily increase the likelihood of motion sickness in a virtual environment.

Effect of peripherally and cortically evoked swallows on jaw reflex responses in anesthetized rabbits
This study aimed to investigate whether the jaw-opening (JOR) and jaw-closing reflexes (JCR) are modulated during not only peripherally, but also centrally, evoked swallowing. Experiments were carried out on 24 adult male Japanese white rabbits. JORs were evoked by trigeminal stimulation at 1Hz for 30s. In the middle 10s, either the superior laryngeal nerve (SLN) or cortical swallowing area (Cx) was simultaneously stimulated to evoke swallowing. The peak-to-peak JOR amplitude was reduced during the middle and late 10-s periods (i.e., during and after SLN or Cx stimulation), and the reduction was dependent on the current intensity of SLN/Cx stimulation: greater SLN/Cx stimulus current resulted in greater JOR inhibition. The reduction rate was significantly greater during Cx stimulation than during SLN stimulation. The amplitude returned to baseline 2min after 10-s SLN/Cx stimulation. The effect of co-stimulation of SLN and Cx was significantly greater than that of SLN stimulation alone. There were no significant differences in any parameters of the JCR between conditions. These results clearly showed that JOR responses were significantly suppressed, not only during peripherally evoked swallowing but also during centrally evoked swallowing, and that the inhibitory effect is likely to be larger during centrally compared with peripherally evoked swallowing. The functional implications of these results are discussed.

An energy–momentum time integration scheme based on a convex multi-variable framework for non-linear electro-elastodynamics

24 mai 2018
Publication date: 1 September 2018

This paper introduces a new one-step second order accurate energy–momentum (EM) preserving time integrator for reversible electro-elastodynamics. The new scheme is shown to be extremely useful for the long-term simulation of electroactive polymers (EAPs) undergoing massive strains and/or electric fields. The paper presents the following main novelties.
(1) The formulation of a new energy–momentum time integrator scheme in the context of nonlinear electro-elastodynamics. (2) The consideration of well-posed ab initio convex multi-variable constitutive models. (3) Based on the use of alternative mixed variational principles, the paper introduces two different EM time integration strategies (one based on the Helmholtz's and the other based on the internal energy). (4) The new time integrator relies on the definition of four discrete derivatives of the internal/Helmholtz energies representing the algorithmic counterparts of the work conjugates of the right Cauchy–Green deformation tensor, its co-factor, its determinant and the Lagrangian electric displacement field. (6) Proof of thermodynamic consistency and of second order accuracy with respect to time of the resulting algorithm is included. Finally, a series of numerical examples are included in order to demonstrate the robustness and conservation properties of the proposed scheme, specifically in the case of long-term simulations.

The state of immersive technology research: A literature analysis
Despite the increase in scholarly attention paid to immersive technology, such as augmented reality and virtual reality, few studies have been conducted on the current state of immersive technology research, with no aggregation of findings and knowledge. To fill this gap, this study conducted a systematic literature review of immersive technology research in diverse settings, including education, marketing, business, and healthcare. The full range of SSCI journal articles that addressed issues related to immersive technology were searched. Based on rigorous inclusion and exclusion criteria, 54 articles were selected for the final analysis. This literature review analyzed the bibliometric data from the identified studies, their theoretical and methodological approaches, research themes, and contexts. Drawing on the stimulus–organism–response (S–O–R) framework, this study classifies and consolidates the factors associated with immersive technology use. Based on that classification, this study proposes a conceptual framework that accounts for the interplay between key elements associated with immersive technology use. The list of factors was then consolidated and mapped onto the S–O–R framework. As a result, this study identifies existing gaps in the current literature and suggests future research directions with specific research agendas.

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Sex-dependent and sex-independent muscle activation patterns in adult gait as a function of age

Introduction Aging leads to poorer neuromuscular control that may impact mobility. However, the specific decades when these changes occur, and whether these time-based changes are sex-specific, are unclear. Methods Adults aged 20–82 years (N=93, 51 females) walked six gait trials at their preferred speed over a 10-m platform. Electromyography (EMG) of the rectus femoris (RF), tibialis anterior (TA), and gastrocnemius lateralis (GL) were measured using wireless surface sensors. Root mean square (RMS) and within-cycle coefficient of variation (CV) values were calculated for several phases of gait. Mixed effect models were conducted to test for Age, Sex, Muscle, and interaction effects, covarying for gait speed and stride length. Results A significant Age×Sex×Muscle interaction on RMS at the mid-swing phase was found (p=.036), showing 4.2% higher RF RMS for males (=0.42, p=.008) and 3.3% higher GL RMS for females (=0.33, p=.038) with each of the three decades investigated. Significant Age×Muscle interactions on GL RMS were found at loading, mid-stance, and over the full gait cycle (ps<.05), with 2.0–4.3% higher values per decade (=0.20–0.43, ps<.05). There was generally higher CV with higher age at mid-swing and over the full gait cycle (significant Age effects, ps<.05). Females showed higher CV at loading, mid-stance, and terminal stance (significant Age×Sex effects, ps<.05). Discussion/conclusion Results suggest sex-dependent influences of age on muscle recruitment during a few specific phases of gait, and sex-independent influences of age on the recruitment of the ankle musculature, and on the overall gait cycle. These influences may help explain overall increased instability and fall risk in older adults.
Mode tracking using multiple data streams

24 mai 2018
Publication date: September 2018
Source: Information Fusion, Volume 43

Author(s): Mohamed-Rafik Bouguelia, Alexander Karlsson, Sepideh Pashami, Sawomir Nowaczyk, Anders Holst

Most existing work in information fusion focuses on combining information with well-defined meaning towards a concrete, pre-specified goal. In contradistinction, we instead aim for autonomous discovery of high-level knowledge from ubiquitous data streams. This paper introduces a method for recognition and tracking of hidden conceptual modes, which are essential to fully understand the operation of complex environments, and an important step towards building truly intelligent aware systems. We consider a scenario of analyzing usage of a fleet of city buses, where the objective is to automatically discover and track modes such as highway route, heavy traffic, or aggressive driver, based on available on-board signals. The method we propose is based on aggregating the data over time, since the high-level modes are only apparent in the longer perspective. We search through different features and subsets of the data, and identify those that lead to good clusterings, interpreting those clusters as initial, rough models of the prospective modes. We utilize Bayesian tracking in order to continuously improve the parameters of those models, based on the new data, while at the same time following how the modes evolve over time. Experiments with artificial data of varying degrees of complexity, as well as on real-world datasets, prove the effectiveness of the proposed method in accurately discovering the modes and in identifying which one best explains the current observations from multiple data streams.

A sensor fusion approach for drowsiness detection in wearable ultra-low-power systems

24 mai 2018
Publication date: September 2018
Source: Information Fusion, Volume 43

Author(s): Victor Javier Kartsch, Simone Benatti, Pasquale Davide Schiavone, Davide Rossi, Luca Benini

Drowsiness detection mechanisms have been extensively studied in the last years since they are one of the prevalent causes of accidents within the mining, driving and industrial activities. Many research efforts were done to quantify the drowsiness levels using behavioral analyses based on camera eye tracking systems as well as by analyzing physiological features contained in EEG signals. Detection systems typically use specific drowsiness indicators from only one of these methods, leaving a risk of missed detection since not all the population presents same symptoms of drowsiness. Thus, multi-feature systems are preferable even though most of the current State-of-the-Art (SoA) solutions are based on power-hungry platforms and they have meager chance to be used in embedded wearable applications with long battery lifetime. This work presents a drowsiness detection scheme fusing behavioral information coming from user motion through an IMU sensor and physiological information coming from brain activity through a single EEG electrode. The solution is implemented and tested on a low power programmable platform based on an
ARM Cortex-M4 microcontroller, resulting in a wearable device capable to detect 5 different levels of drowsiness with an average accuracy of 95.2% and a battery life of 6 hours, using a 200 mAh battery. We also study the energy optimization achievable by accelerating the sensor fusion-based drowsiness detector on a parallel ultra-low power (PULP) platform. Results show that the use of PULP as efficient processing platform provides an energy improvement of 63x with respect to a solution based on a commercial microcontroller. This may extend the battery life of the complete system up to 46 h with a 7x improvement, paving the way for a completely wearable, always-on system.

The red ear syndrome in upper cervical degenerative spine pathology; Case report and literature review

24 mai 2018
Publication date: September 2018
Source: Interdisciplinary Neurosurgery, Volume 13

Author(s): Chirchiglia Domenico, Chirchiglia Pasquale, Murrone Domenico

Biomechanical exposure of industrial workers – Influence of automation process

24 mai 2018
Publication date: September 2018
Source: International Journal of Industrial Ergonomics, Volume 67

Author(s): Francisco Locks, Gert-Åke Hansson, Helen Cristina Nogueira, Henrik Enquist, Andreas Holtermann, Ana Beatriz Oliveira

Automated processes in industry have been implemented in order to get higher production rates, but our knowledge about their effects on physical exposure of the workers is still limited. Muscular load, postures, and movements of the head, neck/shoulders, upper arms, and wrists were recorded in 19 operators from two different car clutch disc production lines (manual and semi-automated). Higher angular velocities of the head, upper back, and upper arms were found on the manual production line (on average 20% higher than the semi-automated). Upper trapezius, and forearm extensor rest (% time), as well as hand kept still (% time) were also higher on the manual production line. No difference was found regarding posture, muscular activities, and repetitiveness. The manual line had more rest, but more vigorous movements considering angular velocities. The semi-automated line, therefore, implied a higher production rate with lower angular velocities but fewer opportunities for rest than the manual line. While different physical exposures were found when comparing these two production lines with different levels of automation, the health effects derived from industrial automation ought to be investigated with a larger sample size. Relevance to industry The reduction of rest opportunities observed on a semi-automated production line requires the attention of ergonomists when planning or redesigning tasks in such production lines. Lack of rest is considered a risk factor for the development of musculoskeletal disorders.
Leg and back muscle activity, heart rate, performance and comfort during sitting, standing, and using a sit-stand-support with different seat angles

24 mai 2018
Publication date: September 2018
Source: International Journal of Industrial Ergonomics, Volume 67

Author(s): Corinne Nicoletti, Thomas Läubli

Long-lasting sitting and standing is related to several health risks and alternatives to these positions are needed. This study compared muscle activity, heart rate, performance, and comfort between sitting, standing, and using a stable sit-stand-support with four different seat angles. Twenty-one subjects fulfilled three tasks (typing, a tweezing task and a task simulating ironing) in every position for five minutes. The heart rate was higher using a sit-stand-support and standing compared to sitting. The activity of the m. erector spinae was similar or lower using a sit-stand-support compared to sitting or standing. The activity of the m. gastrocnemius was in between the levels of sitting or standing. No significant differences were observed for the performance. The sit-stand-support most often was preferred to sitting. A stable sit-stand-support may be a solution for short interruptions of sitting or standing. Relevance to industry A stable sit-stand-support may be an option for short interruptions of sitting and standing and may reduce the consequences of these static positions.

High obsessive-compulsive individuals may have attenuated access to internal cues associated with active movement: Evidence from a head repositioning study

24 mai 2018
Publication date: September 2018
Source: Journal of Behavior Therapy and Experimental Psychiatry, Volume 60

Author(s): Or Ezrati, Eyal Sherman, Reuven Dar

Background and objectives The Seeking Proxies for Internal States model of OCD posits that obsessive-compulsive (OC) individuals have attenuated access to their internal states. Consequently, they seek and rely on discernible substitutes for these internal states. Previous research has supported these conjectures. Other studies, using a variety of measures, reported a reduced sense of agency (SoA) in OCD. The current study aimed to connect these two bodies of research by focusing on internal signals associated with active movement, which are related to the SoA. We hypothesized that the performance accuracy of high OC participants would be similar for active and passive movements, while that of low OC participants would be higher when the movement is acquired actively. Method Participants with high vs. low OC tendencies were asked to reposition their head to a target angle that was acquired actively or passively. This was repeated with eyes blindfolded to evaluate reliance on visual information. Accuracy of repositioning was measured with a cervical range-of-motion device. Results As predicted, while low OC participants presented a significant decrease in their accuracy after passive (compared to active) acquisition, high OC participants’ accuracy did not differ between acquisition types. Contrary to our predictions, reliance on vision was similar across groups. Limitations The generalization of our findings to OCD requires replication with a clinical sample. Conclusions This study implies that high OC individuals have a deficient access to internal cues involved in active movement. This might contribute to their doubt regarding their actions.
**Development of printed and flexible dry ECG electrodes**

24 mai 2018  
Publication date: September 2018  
Source: Sensing and Bio-Sensing Research, Volume 20  

Author(s): Amer Abdulmahdi Chlaihawi, Binu Baby Narakathu, Sepehr Emamian, Bradley J. Bazuin, Massood Z. Atashbar

Printed, flexible and wearable dry electrodes for monitoring electrocardiogram (ECG) signals, without any skin preparation and use of wet gel, has been developed. Silver (Ag) flake ink was screen printed on a flexible polyethylene terephthalate (PET) substrate to fabricate the dry ECG electrode. Multi-walled carbon nanotube (MWCNT)/polydimethylsiloxane (PDMS) composite, as a conductive polymer, was then deposited on the printed Ag electrode by using a bar coating technique. The performance of the printed electrodes was investigated by testing the MWCNT/PDMS composite conductivity and measuring the electrode-skin impedance for electrode radii varying from 8mm to 16mm. It was observed that the dry ECG electrode, with the largest area, demonstrated better performance, in terms of MWCNT/PDMS composite conductivity, ECG signal intensity and correlation when compared to a commercial wet silver/silver chloride (Ag/AgCl) electrode. In addition, the capability of the dry ECG electrodes for monitoring ECG signals in both the relaxed sitting position and while the subject is in motion, was also investigated and the results were compared with a wet Ag/AgCl ECG electrode (T716). While the subject is in motion, the printed dry electrodes were less noisy and were able to better identify the typical ECG characteristics in the signals due to its better conformal contact at the electrode-skin interface. The results obtained demonstrated the feasibility of employing conventional screen printing process for the development of flexible dry ECG electrodes for applications in the biomedical industry.

**Psidium cattleianum fruits: A review on its composition and bioactivity**

24 mai 2018  
Publication date: 30 August 2018  
Source: Food Chemistry, Volume 258  

Author(s): Elisa dos Santos Pereira, Juliana Vinholes, Rodrigo C. Franzon, Gabriel Dalmazo, Márcia Vizzotto, Leonardo Nora

Psidium cattleianum Sabine, commonly known as araçá, is a Brazilian native fruit, which is very juicy, with sweet to sub acid pulp and a spicy touch. The fruit can be eaten fresh or processed into juice, jellies and ice creams. Araçás are source of vitamin C, minerals, fatty acids, polysaccharides, volatile compounds, carotenoids and phenolic compounds, which can provide nutrients and phytochemical agents with different biological functions. Different pharmacological studies demonstrate that P. cattleianum exerts antioxidant, antidiabetic, anticarcinogenic, antimicrobial, anti-inflammatory and antiaging effects. Thus, this article aims to review the chemical composition and biological effects reported for araçá fruit in the last years.
A new automatic sleep staging system based on statistical behavior of local extrema using single channel EEG signal

24 mai 2018
Publication date: 15 August 2018
Source: Expert Systems with Applications, Volume 104

Author(s): Saman Seifpour, Hamid Niknazar, Mohammad Mikaeili, Ali Motie Nasrabad

Over the past decade, converging evidence from diverse studies has demonstrated that sleep is closely associated with the mental and physical health, quality of life, and safety. Visual sleep scoring provides an initial and tangible illustration of how the brain wave changes across different sleep stages. The main objective of the present study is to design an accurate and robust computer-assisted sleep stage scoring system using single-channel EEG signal by proposing a novel time domain feature named Statistical Behavior of Local Extrema (SBLE). SBLE provides a profound understanding of hidden dynamics of EEG signals by quantifying and symbolizing its local extrema information, extracting and defining various patterns, and statistical analysis of extracted patterns. First, each EEG segment was decomposed into 6 frequency sub-bands (i.e., low-delta, high-delta, theta, alpha, sigma, and beta). Next, SBLE features were separately computed from each sub-band. Then, an optimal feature set with a high rate of accuracy was selected using a supervised Multi-Cluster/Class Feature Selection (MCFS) algorithm. Finally, the selected features were fed to a multi-class Support Vector Machine (SVM) for classification purposes. The benchmark Sleep-EDF dataset and DREAMS Subject Database were employed to evaluate the performance of the proposed framework. The average (± variance) accuracy rates were 90.6±4.2%, 91.8±5.0%, 92.8±3.3%, 94.5±3.4%, 97.9±1.4% for six-stage to two-stage sleep classification on Sleep-EDF dataset, respectively. Besides, its performance on DREAMS Subjects Database was also promising in term of accuracy, sensitivity, specificity, and Cohen's Kappa coefficient. Experimental results suggest that the proposed methodology can precisely solve the multi-class sleep stage classification problem by presenting an innovative symbolic approach similar to physician's point of view.

Reversible sensory polyneuropathy during an arboviral outbreak in Salvador, Bahia, Brazil

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Source: Journal of the Neurological Sciences, Volume 391

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Contextualizing action observation in the predictive brain: Causal contributions of prefrontal and middle temporal areas

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Context facilitates the recognition of forthcoming actions by pointing to which intention is likely to drive them. This intention is thought to be estimated in a ventral pathway linking MTG with frontal regions and to further impact on the implementation of sensory predictions within the action observation network (AON). Additionally, when conflicting intentions are estimated from context, the DLPFC may bias action selection. However, direct evidence for the contribution of these areas to context-embedded action representations in the AON is still lacking. Here, we used a perturb-and-measure TMS-approach to disrupt neural activity, separately in MTG and DLPFC and subsequently measure cortico-spinal excitability while observing actions embedded in congruent, incongruent or ambiguous contexts. Context congruency was manipulated in terms of compatibility between observed kinematics and the action goal suggested by the ensemble of objects depicted in the environment. In the control session (vertex), we found an early facilitation and later inhibition for kinematics embedded in congruent and incongruent contexts, respectively. MTG stimulation altered the differential modulation of M1 response to congruent vs. incongruent contexts, suggesting this area specifies prior representations about appropriate object graspability. Interestingly, all effects were abolished after DLPFC stimulation highlighting its critical role in broader contextual modulation of the AON activity.

Increases in motor cortical excitability during mirror visual feedback of a precision grasp is influenced by vision and movement of the opposite limb

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Unimanual grasp movements with mirrored visual feedback (MVF) can improve function and increase excitability of primary motor cortex (M1) ipsilateral to the moving hand. However, no study to date has examined the contribution of vision and movement of the opposite hand during an object-directed precision grasp. In this study, we tested 15 healthy individuals in three conditions: MVF (vision+motor), Movement (motor component), and Action Observation (vision component). We hypothesized that unimanual grasp movements with MVF increases the excitability and reduces intracortical inhibition of the M1 ipsilateral to the moving hand. We found increased excitability in the right primary motor cortex (M1) ipsilateral to the moving right hand for MVF movements compared to Rest (Baseline). In contrast, no change was found in right M1 with only movement of the right hand or observation of object-directed precision grasp with left hand. We also found a reduction in short-interval intracortical inhibition in MVF movements compared to baseline. These findings suggest that excitability in M1 during an object-directed precision grasp is mediated by the combination of viewing the movement performed and performing the movement from the opposite hand.