ELSEVIER

CrossMark

The Spine Journal 16 (2016) 552–557

THE SPINE JOURNAL

Review Article

Perioperative complications associated with spine surgery in patients with established spinal cord injury

Michael H. Moghimi, MD[a], Charles A. Reitman, MD[b,*]

[a]*Department of Orthopedic Surgery, Baylor College of Medicine, 6620 Main St, Ste 1325, Houston, TX 77030, USA*
[b]*Department of Orthopedic Surgery, Baylor College of Medicine, 7200 Cambridge, Floor 10A, Houston, TX 77030, USA*

Received 17 April 2012; revised 23 April 2014; accepted 11 June 2014

Abstract

BACKGROUND CONTEXT: Only a small percentage of patients with spinal cord injury (SCI) require consideration for reconstructive surgery after their initial injury. For those who do, perioperative complications can be frequent and significant. There has been very little published literature examining treatment of these patients and essentially nothing to guide the surgeon in perioperative decision making and management.

PURPOSE: To identify some of the common challenges associated with surgery in this patient population and review the literature to highlight the perioperative concerns in patients with chronic SCI.

STUDY DESIGN: Review article.

METHODS: A primary PubMed literature search was performed and reviewed for patients with chronic SCI with emphasis on the complications and difficulties encountered during surgical treatment of patients with chronic SCI.

RESULTS: For those who do proceed with surgery in this patient population, preoperative nutrition, bone density, and skin should be evaluated and optimized. Preoperative inferior vena cava filters should be considered. The integrity of the reconstruction will be extensively challenged. In addition, augmented fixation and bracing should be contemplated.

CONCLUSIONS: Patients with chronic SCI who require spinal reconstruction provide many unique challenges. Indications for surgery must be strong as perioperative complications can be frequent and long-term outcomes unpredictable. Close monitoring for postoperative complications is essential.

Keywords: Chronic spinal cord injury; Spinal reconstruction; Charcot spine; Spinal augmentation; Spinal trauma; Complications

Introduction

Currently, the best estimates predict about 12,000 new cases of spinal cord injury (SCI) every year [1]. About 40% are complete injuries, with the majority being thoracolumbar spine injuries resulting in paraplegia [1]. Most patients are under 35 years of age, with approximately 80% being male [2], and many benefit from surgical stabilization for their traumatic injury. Relative to patients without SCI, they have both common and unique concerns associated with their perioperative course, and these are well understood and anticipated. In the subacute and chronic phases of SCI, operative indications are much different, and the nature of the challenges and complications changes. These patients are much different. They can have established problems with neuropathic pain, malnutrition, ulcers, spasticity and contractures, depression, recurrent infections, atrophy, osteoporosis, and neurogenic bowel and bladder issues. Unfortunately, there are no known data on the frequency of spinal reconstruction in the patient population with chronic SCI, and similarly, an extensive search of the English literature revealed no data other than case reports for complications associated with these surgeries. For certain, the incidence of surgery is low, but just as certain, the technical challenges for successful reconstruction are significant in this distinctive patient population. Other than infection, the primary reasons for spinal reconstructive

FDA device/drug status: Not applicable.

Author disclosures: ***MHM:*** Nothing to disclose. ***CAR:*** Nothing to disclose.

* Corresponding author. Department of Orthopedic Surgery, Baylor College of Medicine, 7200 Cambridge, Floor 10A, Houston, TX 77030, USA. Tel.: (713) 986-7410; fax: (713) 986-5661.

E-mail address: creitman@bcm.edu (C.A. Reitman)

1529-9430/$ - see front matter
http://dx.doi.org/10.1016/j.spinee.2014.06.012

surgery in the patient with chronic SCI include pseudarthrosis, Charcot spine, and neuromuscular deformity. The purpose of this report is to highlight many common challenges associated with surgical care, review the literature to highlight the perioperative concerns, and provide some guidance for management of patients with chronic SCI.

Discussion

Patients with chronic SCI have several unique characteristics that make them vulnerable to complications associated with surgery. Based on the personal experience and a review of what literature exists, the following is an attempt to summarize some of these unique complications. Although there are certainly intraoperative considerations, this review centers around perioperative complications and planning.

Thrombosis/deep vein thrombosis

Patients with acute SCI are highly susceptible to thrombotic events [3–5], and thrombosis has been reported as early as 72 hours after injury [6]. The frequency of deep vein thrombosis in patients with acute SCI without prophylaxis has been reported to range form 47% to 100% [7–10]. Secondary to these well-known risks, chemical prophylaxis is the standard of care for the first 3 months after injury [11]. On the other hand, there have only been a few studies that report on venous thrombotic events that occur more than 3 months after injury [12–14]. To our knowledge, there are no reports on the specific risk of deep venous thrombosis or pulmonary embolus (PE) after reconstructive spinal surgery in patients with chronic SCI. However, several risk factors exist that would place these patients in a high-risk category. In addition, onset of chemical prophylaxis after surgery may be delayed for several reasons including immediate concerns for epidural bleeding, the need for repeat or staged surgeries, and wound drainage particularly with revision incisions. Thus, it is likely appropriate to consider placement of an inferior vena cava (IVC) filter before surgery. This at least protects against the more serious sequelae of venous thrombosis such as PE [15]. Rosner et al. [16] looked at placement of prophylactic IVC filters in patients who were considered high risk for thrombotic events undergoing complex spinal surgery versus match individuals who received mechanical prophylaxis and chemoprophylaxis. They showed a PE rate of 0% in the IVC filter group versus 12% in the mechanical and chemoprophylaxis groups. Although IVC filters are not without their own complication, they appear to be a safe alternative to chemoprophylaxis for PE in the immediate postoperative period.

Nutritional status and bone metabolism

Chronic SCI is associated with osteopenia, and this increases the risk of fracture below the level of injury. Although disuse may be the primary cause of osteopenia, identification of any additional mechanisms of bone loss, such as the nutritional status of the patients, must be considered before surgery and any deficiencies optimized. Chronic SCI patients may be prone to certain metabolic deficiencies, particularly vitamin D. Nemunaitis et al. [17] looked at 100 patients with SCI who were consecutively admitted to an acute inpatient rehabilitation center over 1 year. They found that the prevalence of 25-hydroxy vitamin D inadequacy or severe deficiency was 93%. It has been well established that after acute SCI, immobilization causes increased bone resorption, net efflux of calcium and phosphate from bone (increased serum phosphate and ionized calcium), decreased parathyroid hormone, and hypercalciuria [18,19]. The effects of chronic SCI on the calcium regulatory system are not well understood. Calcium, phosphate, and the parathyroid hormone levels must be considered before surgery in chronic SCI patients [19,20]. Nutritional status as measured by prealbumin and optimization with diet before a surgery is also critical. Inspection of the integument and addressing any skin lesions should be done before reconstructive surgery so that they do not affect postoperative rehabilitation protocols or increase risk of infection.

Bone mineral density

In SCI patients, the hardware bone interface is clearly an issue. There are conflicting reports regarding bone mineral density (BMD) in the patients with established SCI. These reports are essentially all based on studies of density 1 or 2 years after injury. There is no information at 5 years let alone 20 years after injury. All studies agree that the bone density in the metaphyseal areas of long bones below the level of the lesion, femur and tibia in particular, diminishes substantially with time in SCI patients [19,21–23]. Dauty et al. [24] looked at 31 SCI patients and found a 52% and 70% decrease in BMD in the distal femur and proximal tibia, respectively, greater than 1 year after injury. However, the dispute arises over the axial skeleton. Some have reported similar bone densities over time in both the vertebral column and the pelvis [25,26]. The theory is that the sustained weight bearing on the spine in the sitting position helps to maintain the bone density [21,22,27]. However, recent reports have challenged the notion that the axial skeleton is spared loss of BMD in SCI patients [28–30]. These reports question the method used for testing BMD, showing that the standard method of testing may be misleading. The studies have revealed that the standard posteroanterior dual-energy X-ray absorptiometry overestimates BMD, whereas lateral dual-energy X-ray absorptiometry and quantitative computed tomography scans are more reliable indicators of osteoporosis in SCI patients [28–30]. These more recent findings seem to confirm declining bone densities in the axial skeleton that is certainly consistent with the clinical course in some of the patients