

Osteoporotic Fractures Following Spinal Cord Injury: A Serious Health Problem

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Introduction

Osteoporosis is characterized by low bone mass, deterioration of the bone microarchitecture and increased bone fragility, which inevitably result in an amplified risk for fractures [1].

Spinal Cord Injury (SCI) is strongly associated with declined bone mineral density and increased incidence of osteoporosis. This is a serious complication of the spinal injury as the osteoporotic paralysed limbs of the SCI patients are vulnerable to pathological fractures even after subtle and no obvious trauma.

Bone loss in these patients is higher in the first six months after the SCI and stabilizes between 12 and 16 months, with about 30% loss of bone mass [2].

There are several causes affecting bone mass in the SCI patient and the mechanism of pathogenesis is not totally clarified.

In SCI individuals, even when partial motor control remains, the severe ambulatory restriction, the weight-bearing loss and the concomitant muscle atrophy are associated with increased risk of serious bone mass decline.

An interesting observation is that although upper limbs are normally innervated, bone loss also occurs in the upper extremities in patients with paraplegia. This suggests that hormonal changes are apparently involved in bone loss following these injuries [3]. These metabolic changes include hypercalcemia, hyperphosphatemia, and hypermagnesuria, and may be seen more likely in patients with simultaneous Traumatic Brain Injury (TBI) [4]. More specifically during the first months following injury calcium homeostasis is critically altered and hypocalcaemia and hypercalciuria, are the most commonly recorded abnormalities [5].

Osteoporosis affects predominantly the lower extremities and the pelvis [6]. The proximal and distal femur and the proximal tibia represent the most affected parts of the lower limbs [7-12]. On the contrary, upper limb and especially forearm fractures are not usually encountered [9]. The prevalence of long-bone fractures has been estimated to be between 1% and 34%, though the low recorded rate is probably underestimated due to numerous unreported or even untreated cases [8,13,14].

These fractures are usually the result of a minimal trauma such as wheelchair-bed transfers and falls on the osteoporotic part of the knee [4,7,12]. They are highly risky injuries as they are associated with several comorbidities such as bedsores, increased spasticity and the formation of malunions [7]. Lengthy hospitalizations are frequently encountered [15].

Risk factors are completeness of injury, body mass index (BMI), and age [16]. More specifically Gartland et al. in their research reported that patients sustained complete injuries were 6.17 times more likely to have BMD of the knee, (number) low enough to place them in the osteoporotic category. Another interesting observation is that every 1-year increase in age, increased the odds of being in the osteoporotic

group by 3.54% [16]. Female patients seem to be more prone to these pathologic fractures as well [9]. Motor complete versus motor incomplete spinal cord injury, level of SCI and the age of initial SCI are independent risk factors for fracture incidence too [8,15].

The treatment of these fractures is mainly conservative including immobilization using well-padded splints, bracing, skeletal traction and fiberglass circular casts followed by early mobilization. In all cases meticulous care of the insensate skin is essential [11,14,17-19].

Complications as pressure sores, increased muscle spasms, hip and knee stiffness, pain autonomic dysreflexia, heterotopic ossification vascular occlusion a nonunion and malunion are not rare after conservative approach [15,18]. On the contrary, complication rates following closed treatment of extremity fractures are reported to be high, ranging from 20% to 40%, and frequently numerous doctor office visits and constant nursing care are required [18].

Operative treatment with open reduction and internal fixation is traditionally recommended only for correcting an important deformity [11] or in a small subgroup of paraplegics including wheelchair athletes, in patient's sustained hip fractures, and in those suffering from autonomic dysreflexia and uncontrollable spasticity [17]. In a classic article on this topic, Nottage since 1981 recommended open reduction and internal fixation of hip fractures to improve sitting balance [14].

Positive results with the use of external fixators for the treatment of femoral shaft fractures have been reported [20]. However in the majority of the surgically treated cases, open reduction and internal fixation with several types of implants have been recorded. Modern implantation includes intramedullary nailing for femoral and shaft fractures i.e. gamma nail, Küntscher and retrograde supracondylar rods and locked plates and screws [18,21,22]. Internal fixation provides early fracture stabilization which maximizes self-transferring and rehabilitation, and decreases hospitalized days and nursing care [18].

Conclusion

Osteoporotic long bone fractures are a well acknowledged health problem affecting SCI individuals which entails major comorbidities.

Choosing between conservative and surgical treatment for every different SCI individual is not easy for a trauma surgeon and the

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decision should be balanced on several parameters such as the patient's general health condition, the fracture's site and its special characteristics and mainly on the surgeon's experience.

Although literature dealing with the interesting topic of therapeutic approach of these difficult managing injuries is not still strong enough to support surgical treatment for all of them, it seems logical that early return to pre injury independence is of vital importance. On the other hand drawbacks following conservative handling as skin ulcers have inevitably devastating consequences for the SCI patients.

Recent studies conclude that surgical intervention is a safe and effective management for fractures affecting myelopathic nonambulatory patients. It should be taken into consideration that anatomic reduction is not the goal of treatment in these patients as malunions have minimal clinical meaning. Quite the opposite major complications such as skin breakdown and lengthening of hospitalization should be avoided in any case.

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