Sternal non-union in a professional hockey player: considerations for return to play

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Abstract

We describe a healthy 40-year old professional hockey player with an asymptomatic sternal non-union following aortic root surgery. The purpose of this case report is to make orthopedic surgeons aware of the possibility of this complication following sternotomy, and to discuss the considerations involved in return to play in contact sports. We will discuss our work-up, evaluation, and management of a sternal non-union in a professional athlete. Patient’s consent has been obtained.

Case report

A healthy 40-year old male professional hockey player was treated with an aortic valve repair and replacement of the ascending aorta for a bicuspid aortic valve and ascending aortic aneurysm. The surgical approach involved a partial sternotomy that was repaired with cerclage wires. His recovery was uneventful, and he was cleared by his thoracic surgeon for full contact activities. Three months from surgery, he was asymptomatic at rest and with exertion, with no tenderness to palpation along the sternum, no evidence of instability with forceful stress, and with full painless range of motion of bilateral upper extremities and normal strength. Because of the history of sternotomy, a CAT scan of the chest was obtained at that time to assess for sternal union prior to clearance to return to full contact activities. This revealed a sternal non-union. A literature search failed to reveal any other reported cases of asymptomatic sternal non-union in athletes. He was not cleared for contact, and was advised to have repeat studies at six months from surgery. A second CAT scan of the chest obtained at six months demonstrated a continued non-union without progression of healing (Figures 1 and 2).

As there were no data available in the literature regarding return to play in contact athletes with an asymptomatic non-union, multiple consultations were obtained, including both cardiac and orthopedic surgeons. The consensus was that he could return to full contact participation as he was asymptomatic at rest and with exertion, with no tenderness to palpation along the sternum, and with full range of painless motion of bilateral upper extremities and normal protective strength. Although there is concern that with a sternal non-union there may be some subtle instabili-

Discussion

Injuries to the sternum and thoracic cage are relatively frequent in patients involved in motor vehicle accidents, high speed sports activities, and industrial accidents, yet non-union of a fracture of the sternum is exceptionally rare. Non-union should be suspected in the following instances: (1) a history of a sternotomy or severe injury to the sternum or chest cage with localized pain and tenderness; (2) persistence of pain over the sternum three months after sternotomy or sternal fracture; (3) radiographic evidence of a persistent fracture line across the sternum; and (4) positive ancillary radiographic tests. In doubtful or suspected non-unions, a CAT scan or bone scan should be obtained. In this case, the patient was asymptomatic, it was felt that due to the high forces and chest wall impact involved in ice hockey that a CAT scan should be obtained as routine pre-participation work-up. There are at least two factors which can contribute to sternal non-union following fracture. First, the sternum receives its blood supply from the internal mammary arteries and intercostal arteries bilaterally, and occasionally an internal mammary vessel may be lacerated by a sternal fracture. Second, the sternum is involved in motions of the chest cage (particularly those of respiration and coughing), and movement at any fracture site is known to adversely influence the healing process. With every breath and movement, the sternal fracture or sternotomy is subjected to forces that tend to distract the fragments. This may be one factor that contributes to non-union, and it certainly must be overcome to create an envi-

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notomy. However, with a non-union there is generally localized pain and tenderness on clinical examination, and later radiographs will show some new bone formation at the fracture or sternotomy site. A CAT scan may be needed to make a diagnosis of a non-union, as in this case. A bone scan may also be a helpful ancillary test.

Regardless of the cause of the sternal non-union, few studies have addressed its treatment. Mayba describes a series of 18 patients who sustained sternal fractures, 2 of whom went on to symptomatic non-unions. Both of these patients were treated with open reduction and internal fixation and healed without complication. Wu et al. presented 6 cases of sterile sternal non-union, including its presentation, treatment with open reduction and rigid-plate fixation, and outcomes. The series consisted of 6 sterile sternal non-unions, 4 of whom received median sternotomies closed with parasternal cerclage wires. All patients complained of sternal pain and remained symptomatic for more than three months. Because sternal non-union is a rare complication, there is no consensus on how to treat these patients. A few methods have been developed over the years that involve various techniques, including some type of fixation, either rigid or semi-rigid, with or without bone grafts. Wu et al. had success with all 6 cases treating the non-union with open reduction and plate fixation. All patients went on to heal clinically and radiographically without complication, and were asymptomatic at the six and 18 month follow-ups.

This case represents a previously unreported clinical situation of an asymptomatic sternal non-union following a sternotomy in an athlete participating in contact sports at professional level. We present this to make orthopedic surgeons aware of the possibility of a non-union following sternotomy. We currently do not have any published guidelines regarding the risk of visceral injury when a non-union is present. We allowed the player to return to play based on clinical criteria of absence of symptoms during antero-posterior and medio-lateral sternal compression, absence of pain with bench press maneuvers and return to non-contact hockey, and a discussion of the theoretical chance of either thoracic visceral injury or creation of symptoms at the non-union site with a contact injury. Also, a partial sternotomy used during the surgical approach rather than a total sternotomy provided added reassurance of stability and protection. There is no literature available that we can use to make a rational decision regarding return to play, and we would need a large series of similarly treated patients to adequately counsel players regarding future risks.

Based on our experience with this athlete, we recommend checking a CAT scan in patients with a recent history of sternotomy prior to returning to contact sports to allow documentation of sternal healing, and suggest that asymptomatic non-union patients be asked to refrain from contact play for six months following surgery to allow formation of stable fibrous tissue at the sternotomy site. It is also recommended to reassess the patient for any symptoms of sternal pain or signs of sternal instability once they have returned to full contact sports.

References