CASE REPORT

A low-energy femoral shaft fracture from performing a yoga posture

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SUMMARY

The femoral shaft is rarely the site of a low-energy fracture in a healthy individual. The vast majority of these fractures are due to major trauma such as motor vehicle accidents. Although low-energy femoral shaft fractures do occur, they are typically in patients with osteoporotic bone, or prosthesis related. In this case report, we present a man in his late 30s who was practising a specific yoga stance when he experienced a femoral shaft fracture.

BACKGROUND

The case is an interesting study in the lesser known risks involved with the growing practice of yoga. It explores an unusual presentation of a femoral shaft fracture as well as the management from the emergency department to the operating theatre and, finally, outpatient follow-up.

CASE PRESENTATION

A healthy 38-year-old Caucasian man who had become an avid yoga enthusiast for the past 2 years, had been practising a number of increasingly difficult yoga styles, and had recently begun Mysore-style Ashtanga yoga. For the past 8 weeks, his daily routine would include approximately 1 hour, each morning, of different stances. One particular stance, known as Marichyasana posture B (figure 1), involved flexing the hip and knee into the opposite inguinal crease. It was during this unassisted stance at his morning yoga class that he heard a loud cracking sound and felt immense pain in his femur. He collapsed to the ground, was unable to weight bear and was immediately brought to hospital by ambulance.

The physical examination in the emergency department found the patient's right lower limb to be shortened and externally rotated. There was a

distinct tenting of the tissues proximal to the knee joint but there was no open wound present. All the lower limb compartments were soft. Distal pulses were present and the patient had no neurological deficits in the limb. He was unable to raise his leg straight and required intravenous morphine analgesia. He was haemodynamically stable and was sent for further imaging.

INVESTIGATIONS

Plain film radiographs demonstrated a spiral fracture of the distal one-third of the femoral shaft (figure 2). The patient then had an ultrasound-guided femoral nerve block and placement of a Thomas splint to maintain temporary stabilisation of the fracture.

TREATMENT

The following day, the patient underwent intramedullary nailing of the right femur (Smith and Nephew—Trigen). The femur was cannulated with the guide wire and measured 380 mm, sequentially reamed to 11.5 mm. The nail inserted was 380 mm×10 mm. Proximal locking ×1 and distal locking ×2. The intramedullary reamings were sent for histological analysis.

OUTCOME AND FOLLOW-UP

The patient's postoperative recovery was uneventful, with no complications. He was mobilising day 1 postoperatively and able to fully bear weight with minor assistance.

He was investigated by bone health and endocrinology department for any abnormalities but, despite his vegetarian lifestyle, he had healthy dietary intake and normal blood results. He was not taking any regular medications. A detailed history found that, 2 weeks prior to the patient's fracture, he had felt a pain in his thigh that he

Figure 1 The Marichyasana posture B as demonstrated from the side and above. The left femur is in the same position that resulted in our patient's fracture.

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Figure 2 Anteroposterior and lateral radiographs of a distal one-third oblique femoral shaft fracture. The fracture is displaced and there is femoral shortening.

ascribed to a muscle strain. He described the pain as a dull ache and attended a physiotherapist, where he was treated for a quadriceps muscle strain. He was able to continue with his daily activities and returned to yoga practice.

Histological analysis of the intramedullary reamings demonstrated the presence of microcallus formation, which suggested previous femoral microfractures. There was no evidence of malignancy or any other pathological process. All the patient's immunological screening tests were normal. He underwent a dual-energy X-ray absorptiometry test, which diagnosed him with osteopaenia (-1.6), and he was subsequently treated with diet lifestyle modification.

The patient was discharged home on postoperative day 10, and was followed up in the outpatient department. At 5 months postoperatively, he was walking almost completely pain free and had returned to yoga; however, he was practising less strenuous postures. His plain film radiographs showed good callus formation and satisfactory fracture alignment (figure 3).

DISCUSSION

Femoral shaft fractures are often the result of high-energy forces and, in the younger populations, are commonly seen as a result of high-speed road traffic accidents.¹ To the best of our knowledge, no previous report has documented a femoral shaft fracture secondary to a yoga stance in a healthy individual.

Yoga is an ancient discipline developed thousands of years ago in India, to bring physiological and psychological benefits to practitioners through posture, breathing and meditation.² Yoga has become extremely popular in North America over the past decade and has even become a recommended adjuvant therapy for certain conditions such as low back pain.³

We identified only three studies that reported a fracture related to yoga. These included a distal tibia epiphyseal separation in a teenager, a proximal phalanx of the great toe fracture and a case series of vertebral compression fractures in osteoporotic or osteopaenic individuals.⁴⁻⁵ There are also a few reports of rare femoral shaft stress fractures in athletes; however, these injuries are typically attributed to repetitive trauma in vigorous

Figure 3 Anteroposterior and lateral radiographs of a distal femoral fracture site at 5 months post intramedullary nailing. Good alignment and callus formation are present.

weight bearing activities such as long-distance running.⁶⁻⁸ While yoga injuries are not that uncommon, the most common adverse events are musculoskeletal related, mainly minor ligament or muscle injuries that recover fully without intervention.⁹

The femur is the longest, strongest and heaviest tubular bone in the human body.¹⁰ It acts as one of the principal load bearing bones in the lower extremity and thus low-energy injuries are much more common in the elderly, as a result of falling from standing height.¹¹ The annual incidence of femoral shaft fractures is approximately 10/100 000 person-years.¹² Complications and injuries associated with mid-shaft femur fractures can be life-threatening, and may include haemorrhage, internal organ injury, wound infection, fat embolism and adult respiratory distress syndrome.¹³ Femoral shaft fractures can cause prolonged disability from fracture shortening, malunion, non-union or prolonged immobilisation of the extremity.

Low-energy femoral shaft fractures occur mainly in patients with chronic comorbidities or conditions causing osteopaenia. The most common pattern associated with low-energy trauma is spiral fractures of the middle third femoral shaft.¹⁴

Atypical femoral fractures are often a group distinct from the commonly seen osteoporosis or major trauma-related fractures. They most commonly have a lack of direct trauma precipitating the fracture, and have been described with an associated prodromal pain in the thigh or knee for weeks prior to the fracture.¹⁵⁻¹⁷ Subtrochanteric and femoral shaft fractures have recently been linked to long-term bisphosphonate therapy.¹⁸⁻²⁰

In summary, the history of the prodromal event, combined with a repetitive high tensile force onto the femur, is consistent with a fracture through a previously weakened femoral shaft. Although this is very rare, should a patient present with pain in an extremity, caution must be taken not to rule out a possible stress fracture. Careful history-taking and understanding of the exercises the patient is practising could be critical to preventing a more serious injury.

Learning points

- Careful history-taking and understanding of the patient's history and the activities the patient is undertaking could be critical to preventing a more serious injury.
- Often assumed as muscular pain, stress fractures should be included in the differential for limb pain.
- Stress fractures can lead to complete fractures if not investigated and treated promptly.
- Yoga-related injuries are becoming more commonplace.
- Intramedullary nailing of femoral shaft fractures remains the gold standard treatment.

Competing interests None declared.

Patient consent Obtained.

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