

Compartment syndrome as a complication of positioning for revision hip arthroplasty—a case report

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A 68-year-old man was admitted for an elective second revision right total hip replacement with impaction bone graft reconstruction. He had undergone primary THR in 1978 and a revision THR in 1995 but was otherwise healthy. On admission, he reported paresthesiae in his left index finger and thumb, with pain in his left wrist. This was thought to be due to a carpal tunnel syndrome, but was not investigated further at this time. In the theater, he was positioned on a standard operating table with air cell mattresses and gel pads in the lateral decubitus position, which is our standard position for primary and revision total hip operations. All monitoring was placed in or on the right arm, which was in a gutter support. The left arm was unprotected and placed under the patient, remaining in this position for 6 hours in total.

The operation was difficult due to scarring, heterotopic bone formation and the size of the reconstruction required. There were no adverse intra-operative events. Immediately after surgery, the patient complained of a swollen painful left arm. On examination, it was noted that the left upper arm was tense and swollen. His forearm was slightly swollen, but not tender. He had full active extension and flexion at his fingers and wrist, but was unable to lift his arm off the bed. Passive elbow flexion and extension were uncomfortable. The radial pulse was present, as also was the ulnar collateral circulation on Allen's test, and capillary refill time was normal at less than 3 seconds. Sensation was reduced below the elbow, with paresthesia. We diagnosed an incipient upper arm compartment syndrome and decided initially to observe the patient for spontaneous improvement. 8 hours later, however, he still had pain and a tense swollen upper arm. Passive elbow movements were more painful and he had no sensation below

the elbow. The extrinsic flexors and extensors, and intrinsic muscles of the hand were all weak. We made a fasciotomy through a medial mid-axial incision and found gross interstitial edema in both the subcutaneous and subfascial compartments. The posterior compartment was opened through the medial intermuscular septum. The triceps, biceps and brachioradialis muscles were all tense, edematous and dusky, but viable, and were decompressed. The brachial artery, median and ulnar nerves and the basilic vein were all exposed and decompressed. The skin incision was closed over deep vacuum drains.

On the following day, his muscle power was stronger and sensation was almost back to its pre-operative state. By day 7 post-fasciotomy, only his index and thumb pulps were numb, the rest of his sensation having returned to the preoperative state. Muscle power was again normal, apart from a mild weakness of the extensor pollicis brevis. He was discharged home 25 days following the revision hip replacement. At review 6 months after surgery, he had full muscle power, apart from mild abductor pollicis brevis weakness and paresthesiae in his index finger and thumb. EMG studies confirmed a left-sided carpal tunnel syndrome.

Discussion

Compartment syndrome in the upper limb was first reported in 1941 following crush injuries from falling masonry during an air raid in London (Bywaters and Beall 1941). 19 cases of upper limb compartment syndrome have been described in the literature, but usually as a result of trauma (Mubarak et al. 1978, Leguitt 1982, Greene and Louis 1983, Holland et al. 1985, Jenkins and

Mintowt 1986, Brumbank 1987, Nixon and Brindley 1989, Smith et al. 1989, Segal and Adain 1990, Gupta and Sharma 1991, McHale et al. 1991, Cameron 1993, Palumbo and Abrams 1994, Ridings and Gault 1994, Sutin et al. 1996, Richards and Moss 1997, Willsey and Peterfreund 1997, Diminick et al. 1999). We believe that this is the first report of upper limb compartment syndrome as a consequence of intra-operative positioning in the lateral decubitus position.

The upper arm is less prone to compartment syndrome, as the investing layer of brachial fascia is thin and therefore accommodates swelling more easily than the forearm or lower limb. In our case, the compartment syndrome arose from compression of the upper limb beneath the body, which caused a reduction in the size and compliance of the fascial compartment. Monitoring of compartmental pressures can be performed as an aid to management in patients with suspected compartment syndrome, but the pressure thresholds for fasciotomy (Matsen et al. 1976, Mubarak et al. 1978, Whitesides and Heckman 1996) are debatable and most studies have been done on the lower limb.

The only treatment for an established compartment syndrome is surgical decompression (Matsen and Krugmire 1978). The medial axial skin incision we used provided wide access to the biceps and triceps compartments, allowing full decompression.

Operative positioning necessitates a compromise between good operative exposure and patient tolerance. The incidence of pressure complications following surgery has been reduced by the use of padded mattresses, padded supports and a general awareness by operating room staff that potential problems exist (Lincoln and Sawyer 1961) or may occur. The commonest neurological injury following lateral decubitus positioning is a tractional injury to the brachial plexus and the use of an axillary roll has been advocated to reduce the incidence of this problem (Lincoln and Sawyer 1961, Nambisan and Karakousis 1989). These rolls can be easily made in the operating room from a one-liter bag of fluid well wrapped in soft padding. The roll is placed under the dependent axilla, at the level of the tip of the scapula. Its mode of action is by transmitting the weight of the

body through the roll, as opposed to through the shoulder and upper arm, thus reducing vascular congestion in the dependent limb and traction on the brachial plexus. In our case, an axillary roll is likely to have reduced the chance of compartment syndrome occurring by reducing the vascular congestion caused by the compression of the limb beneath the body. One case report of complications associated with axillary rolls (skin blistering and haematoma formation) (Furnas et al. 1990), emphasizes the need for careful positioning of a roll of an appropriate size—if it is too high in the axilla, vascular congestion in the upper limb is increased, and too thin a roll is the equivalent of no roll at all.

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