CASE REPORT

Successful stabilisation of a type III paediatric tibial eminence fracture using a tensioned wire technique

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SUMMARY

We report the case of an 11-year-old boy presenting with a type III tibial eminence fracture. The fracture fragment was reduced arthroscopically. Two 1.6 mm retrograde K-wires were inserted from the tibial metaphysis across the physis and into the fracture fragment using a standard anterior cruciate ligament tibial tunnel guide. Once the wires were clearly visible within the joint the tips were bent over by ~120°. The wires were then tensioned around a single small fragment screw inserted into the tibial metaphysis. An exceptionally strong fixation was achieved. The boy was mobilised without a brace. The wires were removed at 12 weeks and he returned to full activity at 14 weeks.

BACKGROUND

There is wide consensus that Meyer and McKee type III tibial eminence fractures should be reduced and stabilised. There is little consensus on the best technique.^{1 2}

Many techniques have been reported using a screw, wire, pin or suture fixation. Some techniques involve temporary fixation across the physis while others use potentially permanent fixation that does not cross the physis.^{3–6} In 2013 Schnependahl *et al*⁷ reported on the successful use of biodegradable sutures for the fixation of tibial eminence fractures in children. While this technique obviates the need for a second operation, we believe that the presented results clinically, radiologically and cosmetically can be judged excellent and may outweigh the disadvantage of the second surgical procedure necessary for implant removal.

In this case the senior author used a modified version of a method previously reported for the treatment of tibial eminence fractures in adults.³ This technique provides firm fixation of the fracture fragment using a tensioned K-wire aligned to the longitudinal pull of the anterior cruciate ligament (ACL). Stable fixation allows early rehabilitation to normal activity.

CASE PRESENTATION

An 11-year-old boy presented to the emergency department unable to weight bear with a grossly swollen right knee. He had fallen from his junior motorbike. X-rays demonstrated a displaced fracture to the tibial eminence (*figure 1*). He was reviewed by the on call orthopaedic team and discharged home on crutches with a plan for an urgent outpatient CT scan and subsequent admission under the specialist paediatric orthopaedic team.

INVESTIGATIONS

His outpatient CT scan confirmed a Meyer and McKee type III tibial eminence fracture (*figure 2*).

TREATMENT

He was taken to the operation theatre 4 days after his injury. The fracture fragment was anatomically reduced arthroscopically and held in position using a standard ACL tibial tunnel guide. A 1.6 mm K-wire was then driven through the proximal anterior tibia,

Figure 1 Preoperative lateral radiograph of the knee.

Figure 2 Preoperative sagittal CT scan of the knee.

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across the fracture site and into the avulsed fragment. The wire was directed to emerge into the knee within the footprint of the ACL insertion. The ACL tunnel guide was then removed and a stout pair of needle holding forceps was used to bend the intra-articular tip of the wire by $\sim 120^\circ$ (figure 3). This wire was then pulled distally and tensioned around a screw that was tapped into the anterior tibia. A second wire was inserted in an identical manner to reinforce the fixation. The stability and restored tension in the ACL were demonstrated by observing the ligament and fragment under direct arthroscopic vision while performing an anterior draw test.

OUTCOME AND FOLLOW-UP

The following day he was able to fully weight bear and he was discharged home without a brace. Two weeks later plain film

radiographs confirmed a maintained anatomical reduction (figures 4 and 5). He was walking confidently without crutches but had lost the last 15° of extension. He was referred for physiotherapy exercises. At 6 weeks postoperative he had a full range of movement and was allowed to return to full activity. At 12 weeks postoperative the screw and wires were removed as a day case procedure. At this second procedure arthroscopy was not repeated. The wires were simply grasped with robust wire-holding forceps and pulled distally out of the front of the tibia.

Fourteen weeks postoperative he had returned to full activity (including riding his motorbike). His wounds had healed well (figure 6). He completed multiple knee function questionnaires including the Modified Cincinnati Rating, Tegner Lysolm Score, Oxford Knee Score, WOMAC Score and IKDC Subjective Knee Evaluation Form. In all domains his knee had entirely returned to normal.

Figure 3 Intraoperative lateral radiograph of the knee.

Figure 5 Postoperative lateral radiograph of the knee.

Figure 4 Postoperative anteroposterior radiograph of the knee.

Figure 6 Postoperative photograph of the knee.

Figure 7 Postoperative coronal CT scan of the knee.

A repeat CT scan demonstrated solid bony union (figures 7 and 8). The senior author has growing confidence in this technique and no longer performs a routine follow-up CT scan.

DISCUSSION

A similar technique has been described in adults.³ The senior author has now used this technique several times in Meyer and McKeever type III tibial eminence fractures in children with excellent results.

Learning points

- ▶ This technique provides excellent tension parallel to the axis of the anterior cruciate ligament.
- ▶ Tension is temporarily applied across the physis with smooth K-wires.
- ▶ The strength of fixation allows rapid rehabilitation.
- ▶ Early removal of the wires prevents any long-term effects to the physis.

Figure 8 Postoperative sagittal CT scan of the knee.

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Contributors Diagnosis, treatment and follow-up were performed by MDL. MA and TP wrote the report.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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