Bone ingrowth within interlocking holes in AO cannulated tibial nail

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Citation

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Abstract

Bone growth around titanium intramedullary nails is well recognized, and can add to the difficulties encountered during its removal.

We describe a case where removal of the nail was complicated by bony ingrowth inside the nail's dynamic locking hole, eight months after removal of the interlocking screw. Adequate insertion of the extraction screw was prevented by this bony ingrowth which was acknowledged after successful removal of the nail using Ipswich Extractor System. The extraction was also initially obstructed by this bone bridging into the nail.

Bone growth into empty proximal interlocking holes should be anticipated before removal of intramedullary nails. Possible solutions are discussed.

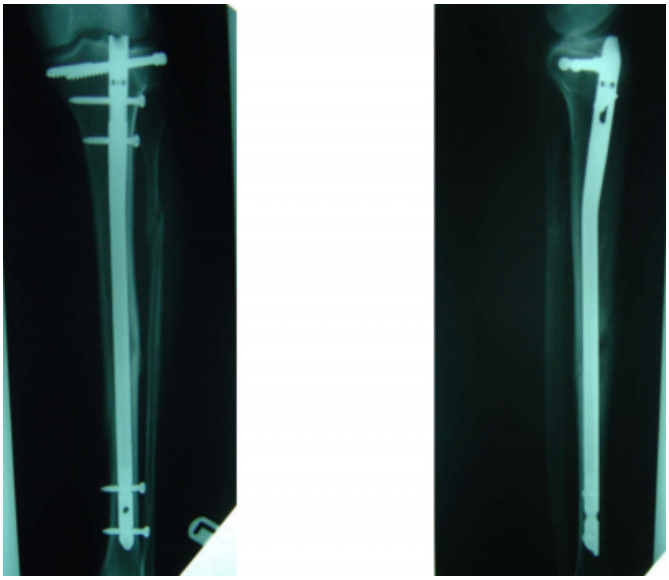
CASE REPORT

A 20 year old man, with history of mild cerebral palsy, was treated for closed lateral tibial plateau and ipsilateral tibial shaft fractures after a road traffic accident as a pedestrian. The fractures were fixed using AO CTN (cannulated tibial nail) 10 mm diameter 330 mm long (Synthes Ltd., Hertfordshire, United Kingdom), and two 7.3 mm cannulated screws for the tibial plateau fracture.

The cannulated 7.3 mm screws and the distal nail locking screws were removed uneventfully at 6 months post operatively, owing to localised pain and tenderness, and after union was confirmed clinically and radiologically (figure 1).

Figure 1

Figure 1:Radiographs taken six months after fixation, before removal of proximal cannulated 7.3 mm screws and distal interlocking screws.



The proximal dynamic locking screw was removed at 22 months after the fixation, owing to the same localizing symptoms. 30 months after the fixation, the nail was removed as a result of anterior knee pain. Before nail removal, the end cap was removed and soft tissues were cleared. The proximal threads of the AO extraction screw failed to advance sufficiently and engage into the nail,

although serious attempts were made to clear any ingrown soft or bone tissue in the diagonal hole, as recommended by the manufacturer's instruction book.[1] Alternatively, an extraction screw with shorter threaded tip (Ipswich Extractor System) was used (figure 2) and engaged to the nail successfully.

Figure 2

Figure 2: Extraction screw (Ipswich Extractor System) engaging well within the nail's threads.

Initially, attempts to extract the screw using the slotted hammer failed to drive the nail proximally. Few gentle taps on the nail, driving it distally, facilitated removal. After removal, bone growth within the proximal diagonal and dynamic locking holes was noticed (figure 3). This may explain the difficulties encountered during engaging the extraction screw and extraction of the nail (figure 4). Post operative course was uneventful.

Figure 3

Figure 3: AO intramedullary cannulated tibial nail (CTN) after removal, showing bone ingrowth within both proximal diagonal and dynamic locking holes.

Figure 4

Figure 4: AO extraction screw was prevented from advancing into the proximal end of the nail by the bone ingrowth within the diagonal hole. Note that even if the extraction screw tip bypassed the diagonal hole, further advancement to engage into the nail's threads would still be prevented by the larger ingrowth within the dynamic hole.

DISCUSSION

Removal of intramedullary nails can be challenging, and intraoperative difficulties are well recognized.[2,3,4] In this case, two problems were encountered during removal of the nail: failure to apply the manufacturer's extraction screw, and difficulty in extracting the nail. These two problems were believed to be caused by the bony ingrowth within the diagonal and, mainly, dynamic locking holes, as illustrated in figure 4.

The AO extraction screw has two bands of threads at its tip. The distal and smaller diameter threads are designed for spiral blade, while the proximal threads are for intramedullary nail extraction. The presence of two sets of threads at the tip of the same screw results in longer tip. This caused the tip of the extraction screw to hit against the bony growth within the locking diagonal hole, or even the dynamic hole, preventing further advancement and engagement into the nail's threads. Therefore, a shorter tip extraction screw (Ipswich Extractor System) could engage easily without coming in contact with the ingrown bone (figure 2).

The large size of ingrown bone, mainly in the dynamic hole, prevented the extraction of the nail initially. Tapping the nail down the tibia may have broken this bony bridge, allowing easier extraction subsequently.

Titanium nails are associated with more bone growth onto the surface of the nail, [5] but we are uncertain whether this contributes to higher risk of bone growth inside the AO CTN nail, or its locking holes.

These intra-operative difficulties should be anticipated when intramedullary nail is to be removed, especially in the absence of screws occupying the interlocking holes. One of the solutions can be drilling the bony ingrowth through the top hole of the nail using 2.5 mm drill bit, being careful not to damage the nail's threads. Providing shorter tip AO extraction screw can allow easier and more secure engagement into the nail without interference of any ingrown tissues. This can be achieved by introducing extraction screws designed for intramedullary nail or spiral blade, each separately, rather than having two different sets of threads on one long screw tip. Nevertheless, it is always helpful to be familiar with alternative instruments (such as Ipswich Extractor System) and check their availability pre-operatively, especially if difficulties are anticipated.

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