

Short Research Communication

Extraction of the Wichita Fusion Nail after Knee Arthrodesis

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Abstract

To avoid a new exposition and partial damage of a knee arthrodesis site due to the removal of the Wichita fusion nail (WFN), a new extraction technique was developed, using a femoral osteotomy at the proximal end of the nail. Fixing the osteotomy with an Ilizarov frame offered the possibility to perform an additional correction of length and/or alignment if necessary.

Key words: Wichita fusion nail, knee arthrodesis

Introduction

In the vast majority of the cases knee arthrodeses are salvage procedures for failed knee arthroplasties. In case of severe infection an external fixation system is the method of choice. However in case of non-infected conditions or after eradication of the infection internal fixation is recommended, either using plates or nails^{1,7,8}. For intramedullary stabilisation long locking nails and the short Wichita fusion nail (WFN) are available^{1,2}. The WFN was developed in the early nineties, at Stryker's company (Kalamazoo, Michigan, USA) by Dr David A. McQueen. It offers an excellent rotational stability, intra-operative compression and provides also the possibility for postoperative dynamic load-bearing. This innovative nail is completely embedded inside the bone and difficult to extract once the knee has fused and thus no longer able to bend. Fortunately removal is only limited to rare cases of persistent pain or infection. The conventional extraction method, as abundantly described in a study by McQueen (2005) and Murphy (2011) and recommended by Stryker's company, requires widening of the previously made anterior bone slot to insert the compression screw component for de-assembling the nail by cutting it into two pieces^{4,6}.

To avoid this inconvenience, a technique was

developed allowing the extraction of the entire nail in one piece without any interference at the arthrodesis site, using a femoral osteotomy that was stabilised with an external circular frame.

Technique

After removal of the locking screws the femur is approached through a lateral incision at the top level of the nail. A cortical window, approximately two by four centimetres is outlined with a 2.5 millimetre drill. With an osteotome the window is turned to the backside, leaving it connected to the soft tissues if possible. In this way the nail becomes exposed. At this stage the external Ilizarov frame is anchored to the femur and tibia, leaving the proximal and distal part disconnected. Subsequently an osteotomy is performed at the proximal cut of the window. With the fixator the long distal bone fragment is dislocated medially making the nail extrude laterally. One of the two locking holes is used to insert a metal rod that allows to tap out the nail in toto with a Kuntscher extraction device hooked on this rod. Immediately after removal the osteotomy is reduced by the fixator and firmly stabilised with a minimum of four threaded rods. The window is turned back in place without additional fixation and the wound is closed.

Postoperative full weight bearing is allowed as soon as the patient feels comfortable. The frame is kept under compression in case no further modification is necessary or adapted for distraction or axial or rotational correction if indicated.

So far the technique was used in three patients, all with an extensive history of infected knee arthroplasties. Their arthrodesis, that was performed with a WFN, healed slowly and they kept complaining of severe pain. Due to the difficulty to obtain the knee fusion it was decided not to open up the arthrodesis once again but to perform the extraction with the femoral osteotomy technique. Two of the three patients underwent an additional lengthening. All osteotomies healed uneventfully. In one patient there was a positive culture of the nail showing coagulase negative Staphylococcus, which might be an explanation for the persistent pain. After removal of the external fixator all patients were pain free both at the arthrodesis and osteotomy site.

Discussion

The WFN is a highly reliable tool for a knee arthrodesis, even in difficult cases, and is reported to have high success rates due to relatively rapid, solid and pain free fusions that can be obtained in a very acceptable time interval^{3,5}. Technically it requires the assembling of the two parts of the nail, which is relatively easy because at the time of this intervention the femur and tibia can still be manipulated.

However, in the rare cases where removal becomes mandatory after fusion of the knee, the surgeon is faced with the difficulty that the nail is completely embedded and cannot be extracted anymore in a simple way. According to its designer Dr McQueen the nail has to be cut at the smallest tibial part allowing extraction of the femoral part through the pre-existing window used for the introduction, which on some occasions should be enlarged⁴. Subsequently the tibial part is retrogradely slid upwards in the femoral canal from which it can then be extracted. In cases where it was already difficult to obtain union it feels uncomfortable to weaken the bone by re-opening the fusion site again to some extent. Barsoum warned that the extraction through a femoral and tibial window is not free of harm due to the risk for pathological fractures. In our technique this complication was deliberately performed, but in a controlled way so that it could be used for the in toto extraction of the nail, without touching the fusion area or the necessity to cut the nail. By using a circular frame not only the fixation was secured, but it also allowed to manipulate the osteotomy in such a way that additional corrections were possible, as illustrated in figure 2. It requires experience with Ilizarov surgery and is probably not the method of choice for every WFN extraction. However to our opinion it represents an elegant way to avoid new surgery at the arthrodesis level in well selected cases.

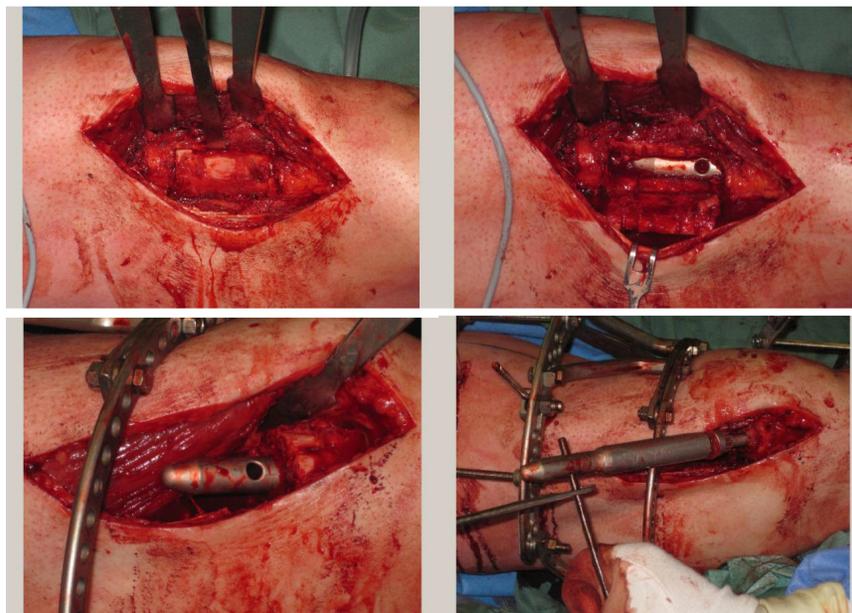


Figure 1: a) Outline of cortical window in the lateral femoral cortex. b) Window turned backwards exposing the nail. c) Fixator in situ, osteotomy performed and distal fragment with nail displaced in varus. d) Extraction of the nail.

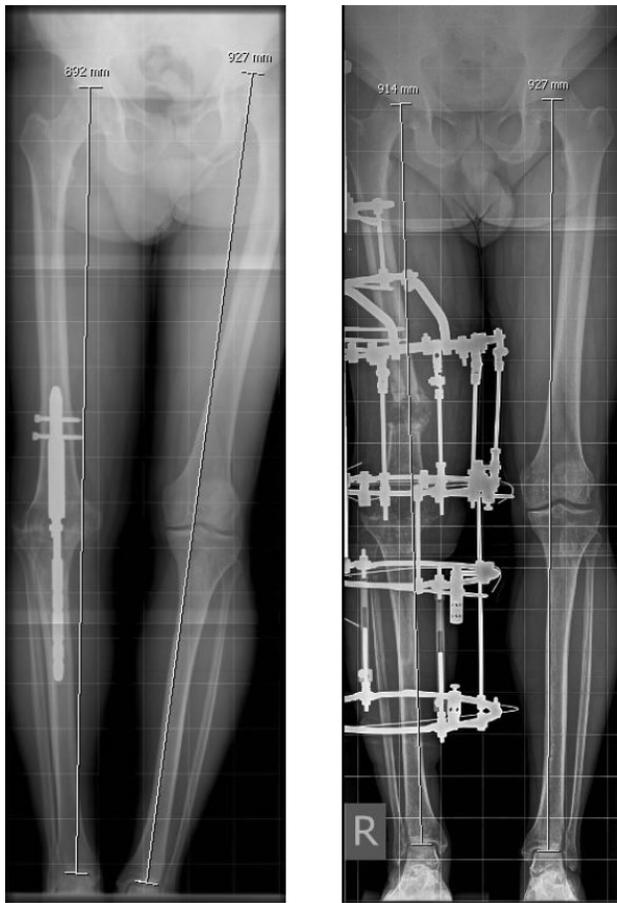


Figure 2: a) RX full leg with WFN in situ. b) RX full leg after extraction of WFN and correction length and alignment.

Competing Interests

The authors have declared that no competing interest exists.

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