CURVED KUNTSCHER NAIL ARTHRODESIS AFTER FAILURE OF KNEE REPLACEMENT

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We report the use of long curved Kuntscher nails to maintain stability during arthrodesis of nine infected and five uninfected failures of total knee replacement. The curvature of the nail helps positioning and avoids the need for cortical perforation. A single-stage operation was possible in most cases. Union rates are comparable with those of other series and even patients with delayed union have satisfactory function.

Revision arthroplasty after failure of a total knee replacement is not always possible. Arthrodesis may be indicated where there is bone loss from multiple operations, failure of stemmed prostheses (Fig. 1), infection or fracture, but reported fusion rates vary from 17% (Shea, Wynn Jones and Arden 1981) to 96% (Woods, Lionberger and Tullos 1983). Griend (1983) considers that failure to achieve fusion usually results from inability to achieve or maintain bone contact, control infection and provide stable fixation.

Intramedullary nails have been shown to provide greater stability than quadrilateral frame external fixation (Mazet and Urist 1960; Stulberg 1982) and have been used successfully in infected cases by a two-stage procedure (Knutson and Lidgren 1982; Harris and Froelich 1985). Straight Kuntscher nails may cause tibial or femoral fractures or perforation (Fig. 2) because of the curvature of the femur (Knutson, Lindstrand and Lidgren 1985); they also make the functionally desirable position of slight flexion difficult to achieve (Brodersen et al 1979). Deliberate femoral cortical penetration (Mazet and Urist 1960) or custom-made prostheses (Enneking and Shirley 1977; Griend 1983) have been suggested.

We report the use of a standard pre-curved Kuntscher nail to provide stability whilst awaiting arthrodesis in 14 knees after failure of total knee arthroplasty.

PATIENTS AND METHODS

In 13 patients with a mean age of 71 years (range 44 to 81), 14 knee arthrodeses were performed. There were 10 women and three men; the original disease was rheumatoid arthritis in four and osteoarthritis in nine. The failed prostheses were: Stanmore (five, two infected), Sheehan (three, all infected), spherocentric (two, both infected), total condylar (one infected), and one total condylar rotating hinge. Two patients had failure of external frame arthrodeses: one for a loose replacement and one for infection.

Patients were reviewed and radiographed at four- to six-weekly intervals for a mean follow-up of 14 months (range 4 to 36). Radiographs were assessed independently by the two senior authors and union estimated in terms of visible cortical union in the two planes as a percentage of total cortical apposition. This was recorded as: less than 50%, 50% to 75%, over 75%, or complete.

Technique of operation. In cases with purulent infection the prosthesis is removed and gentamicin beads inserted six weeks before the arthrodesis; others had a single-stage procedure. After removal of the prosthesis, all the cement, and devitalised or infected tissue, the femoral and tibial medullary canals are reamed to the appropriate diameter.

Standard Kuntscher nail techniques and instruments are used with special long nails having a longitudinal radius of curvature of 229 cm. This curvature was derived from a study of 100 adult femurs (Biomet, personal
communication). The nail is inserted in retrograde manner into the femur, driven out through an incision over the greater trochanter and then back into the tibia. Definitive bone cuts are then made perpendicular to the nail using a power saw (Fig. 3).

The heel is pushed proximally to appose the cut surfaces and provide counter-pressure as the nail is driven to the correct depth. The nail should be long enough to reach the distal 5 cm of the tibia; this is checked with an image intensifier. In the absence of infection, iliac or patellar bone grafts are inserted into cortical defects. The wound is closed over suction drains which are retained for 48 hours.

Intravenous antibiotics, chosen after sensitivity tests, are given for 48 hours and continued orally for 4 to 7 days in uninfected cases and 5 to 26 days in septic cases. The leg is supported in a removable thermoplastic long-leg cylinder (Neofract) and mobilisation starts after removal of the drains. Full weight-bearing is usually achieved by seven days (range 4 to 12). The cylinder is retained during weight-bearing until union is achieved.

RESULTS

Single-stage arthrodeses were performed for five infected knees in four patients. Bilateral above-knee amputation for progressive vascular disease was necessary in one patient four months later; no evidence of infection was found. Two patients had complete union at eight and nine months and the other had a pain-free, clinically sound limb but with no radiological union at 29 months.

Two-stage procedures were performed on four knees showing purulent infection. Three had united completely at 7, 14 and 18 months respectively; two of these nails have been removed (Fig. 4). One patient was pain-free with 'over 75% union' at 22 months and could walk with one stick.

Of the five arthrodeses performed in uninfected cases one has united fully at seven months and two show 'over 75% union' at 9 and 27 months respectively. One had 'over 75% union' at 28 months, but developed pain
at the distal end of the nail. The nail was removed and the arthrodesis remained clinically sound. The fifth patient has little evidence of union at eight months despite bone-grafting. No patient had any rotational deformity.

**Complications.** A 10 mm diameter nail was used for a one-stage arthrodesis in a 'septic' case; it broke and was replaced with a 12 mm nail. There was complete union at eight months.

One patient had a persistent sinus after a two-stage procedure. There was complete union at 14 months; the nail was removed and the sinus healed.

**DISCUSSION**

Arthrodesis of the knee is indicated when revision arthroplasty is impossible because of inadequate bone stock, and a single-stage procedure offers obvious advantages in frail and elderly patients. When there is purulent infection a two-stage procedure may be safer. Our single-stage results support the use of this method in certain patients.

Woods et al (1983) stress the value of bone grafting, but the introduction of devitalised bone into a previously infected site may be inappropriate. Excluding the bilateral amputee, we obtained complete union in five of our seven infected cases without bone grafting. We grafted only two of our five uninfected cases; neither yet has complete union (one has over 75% at 19 months, the other has under 50% at eight months).

In the six knees with complete union this occurred at a mean time of 10.5 months; four knees showed 'over 75% union' at a mean of 19 months. Knutson et al (1985) reported mean fusion times of 13 months (range 4 to 53 months) in similar difficult cases; they performed secondary bone grafting for delay. All of our patients with delay in union remained free of pain and were able to walk with a stick or frame.

One practical point not previously reported is the final cutting of bone ends after partial insertion of the nail. This allows maximum bony contact in a plane at the ideal 90° to the nail. Griend (1983) has predicted that removal of curved prostheses may be difficult or impossible, but we have removed four long nails with ease.

**Conclusions.** A long curved nail provides a simple method of managing end-stage failure of knee arthroplasty. A single-stage procedure is possible, even in the presence of moderate infection and a slightly flexed position can be maintained without perforating either tibial or femoral cortex. Rates of union compare well with other reported series; all our patients had a functionally sound arthrodesis irrespective of the radiographic appearance.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

**REFERENCES**


