This article considers where arthroscopic techniques fit into the surgical armamentarium, what their limits are, and what tricks and pitfalls are associated with them.

Ian G Winson (UK) and Les Grujic (AUS), members of the AO Foundation’s Foot and Ankle Expert Group (FAEG) together with Andrew Sands (US), Per-Henrik Agren (Sweden), Michael Castro (US), and Juan Gerstner Garces (Colombia).

Arthroscopic ankle arthrodesis: where does this technique fit in?

The debate over the role of arthroscopic techniques in arthrodesis of the ankle remains an active one. Recent publications, including one from a member of FAEG, the largest series published to date, have established this technique as safe and reliable. But where does it fit into our surgical armamentarium, what are its limits, and what are the tricks and pitfalls of this surgical technique? This article is a discussion between Les Grujic (LG), a member of FAEG, who has large experience with open arthrodesis, and Ian Winson (IW), president of the European Foot and Ankle Society and a member of FAEG, who has large experience of arthroscopic ankle arthrodesis.

Early publications of arthroscopic arthrodesis described various features of the technique and yet showed a contrast in information about success rates and benefits. Assumptions seem to be that the fusion rates were lower or at best equal to other techniques and yet it was also suggested that fusion occurred more rapidly. In spite of no scientific data, presumptive limitations were placed on the achievable degree of angular correction. Though it remains obligatory to study the technique scientifically, some further guidance can be obtained from the literature to date.

Question 1  Many techniques for ankle arthrodesis exist with variable fusion rates. Is the fusion rate lower with arthroscopic ankle arthrodesis as adequate exposure and preparation of the joint surface appears difficult? The fusion rate for arthroscopic arthrodesis reported in the published literature equals the highest fusion rates for open arthrodesis. In the series I (IW) have published in the JBJS, there were 9 nonunions in 118 cases. There is a learning curve, as the nonunion rate in the first 16 cases was 5 cases as compared to 4 cases in the last 102 cases. This is in keeping with more recent, large series of arthroscopic arthrodesis reporting non-union rates between 3 and 4%. It appears to be an effective and reproducible technique in terms of union rates in different practitioner’s hands.

Access to the ankle for an arthroscopic arthrodesis can be difficult for someone not undertaking ankle arthroscopy on a regular basis. With arthrodesis being essentially a destructive procedure unlike conventional arthroscopy, access to the joint can be “forceful”! It should be remembered that in most forms of arthritis the joint space is not narrowed, but due to loss of the articular cartilage there is a relative increase in the joint space. With the use of an ankle distractor the joint space in many cases can be relatively wide. The exception to this is where there are genuine soft-tissue contractures as evident after very extensive trauma where genuine arthrofibrosis has occurred or in psoriatic arthritis. It always remains good advice to start with the simpler cases and as experience is gained advance to more difficult cases.

Once access to the joint is achieved, conventional power instrumentation can be used to prepare the joint surface to bleeding cancellous bone. Fixation with percutaneous screws under image intensifier control is relatively straightforward.
Question 2  Is arthroscopic ankle arthrodesis an in situ arthrodesis? Posterior translation has been advocated by many authors to improve gait. Is an adequate posterior translation possible using arthroscopy? Early reports of arthroscopic ankle arthrodesis advocated the use of cross screws, one through the fibula and one put in medially. This distribution of screws has been abandoned by most people regularly undertaking this procedure. One of the major reasons for this is the need to address the positional issues dictated by ideal biomechanical considerations. The first part of translating the talus into the ideal position mechanically is to produce a degree of external rotation; this can be achieved by clearing the osteophytes laterally and if necessary, anteriorly. Similarly, translation posteriorly can be achieved by careful resection down the medial side and posteriorly. In particular, the posterior part of the tibia can be resected from the front. Two screws placed from the medial side of the tibia and sloping from posterior medially to anterior laterally and approximately parallel, pull the talus posteriorly against the medial malleolus. If there is a need to maintain external rotation, placing the most lateral screw first will promote this.

Question 3  Various approaches are available for open arthrodesis, dependant on deformity, previous incisions, and implants. This versatility allows you to address both valgus and varus deformity. How does arthroscopic arthrodesis cope with these problems? Of course the critical issue with any ankle arthrodesis is the position in which the foot ends up. Angular deformity at the level of the ankle is one thing, but the position of the rest of the foot has to be correct. The ideal position for the foot is plantigrade with 5–10 degrees of external rotation and with the forefoot balanced on the floor in weight bearing. Assuming that the only deformity not allowing this position is in the ankle, then arthroscopically this is dealt with in exactly the same way as it would be in an open case. It is notable that in the majority of cases the loss of bone that creates the deformity is on the tibia and as such, removing sufficient bone from the appropriate side, either medial for valgus or lateral for varus, will reduce the angular deformity. Two other issues, the rotational alignment and osteophytes blocking reduction, must be recognized. There is almost invariably an element of equinus and internal rotation of the talus in varus and these have to be corrected, but the same applies to open fusion. In our series it was relatively easy to correct deformity of 25 degrees. A recent publication looked at the correction of 30 degrees-plus and found no difference in the pain and functional scores in this group compared with a group starting with neutral alignment.

Question 4  In your experience, what are the advantages of arthroscopic ankle arthrodesis? What about surgical time, time to fusion, degree of swelling, postoperative pain, and degree of surgical difficulty? The best cases for this technique are those with poor skin or extensive scarring. This technique lowers the risk of postoperative soft-tissue complications as you use only four small stab incisions and avoid major scarred areas. Surgical times vary depending on the complexity of the deformity. I (IW) also think that as you become more experienced you get quicker. An average time would be about an hour, you can rarely force it under 45 minutes, and occasionally it would take two hours, but that
would be exceptional. This consistency of union rates across large series with low nonunion rates speaks for itself.

Some authors think that union can be faster with arthroscopic arthrodesis. I have adopted a cautious approach. I would rarely take them out of a removable cast prior to twelve weeks. But my standard post-operative regime would be two weeks non-weight bearing, 6 weeks partial and one month fully-weight bearing; there is some evidence that you can start weight bearing from the start.

One of the features of arthroscopic arthrodesis is the low incidence of postoperative pain; it is not unusual for patients to comment that they have had no postoperative pain at any stage.

Swelling is difficult to judge as it is dependant on so many factors; again the general impression is for it to be less compared with other hind-foot fusions, but there is no scientific basis to this observation.

Surgical difficulty is relative, and if you are used to doing arthroscopic procedures the technique is relatively straightforward. Most surgical trainees are ready to undertake one on their own after seeing about 3–4, but I think the full learning curve is 15–20. It is important to undertake some training with someone who is experienced in the technique, as many of the tricks, and what to be avoided, can be demonstrated quite quickly.

**Question 5** Do you get good apposition of bony surfaces or is a hole created?

The answer to this is probably yes and yes. Effectively, you always take off a little more centrally than you do at the edges of both tibia and talus. This produces a central contained defect of cancellous bone that should be healthy and bleeding. This appearance can easily be seen at the time of surgery as you are examining the surface with a 2.5 X microscope. The construct is held rigidly in compression with well-placed screws and any relative defect fills in. By producing a relatively uneven surface in good apposition you increase the surface area. Initial x-rays often show a decreased bone density (never a true gap) and serial films show this simply fills in.

**Question 6** Do you ever use bone graft?

No. There are circumstances where there is massive bone loss and as a consequence some form of structural graft is necessary: these are cases where even conventional open arthrodesis may need considerable modification.

**Question 7** How do you deal with a revision?

Obviously this is essentially a primary technique. But for a straightforward fibrous non-union you can remove the metal work and break the fibrous tissue down. I have now revised half-a-dozen cases this way with only one persistent nonunion.
**Question 8**  *Are there any complications specific to arthroscopic arthrodesis?*

Not really. Theoretically, ankle arthroscopy does have an incidence of cutaneous nerve damage not really seen in other types of arthroscopy due to the well-documented variations in anatomy, but this is also the case with open arthrodesis. The incidence of some form of persistent nerve problem is under 1%.

**Question 9**  *What do you consider to be the disadvantages of arthroscopic arthrodesis?*

Few! The main problem is the lack of surgical experience with arthroscopic surgery. If you have passable arthroscopic skills and spend a bit of time with someone who knows what they are doing, this is a technique most people can learn to do and the advantages of soft-tissue handling with all arthroscopic techniques are obvious.