Minimally Invasive Forefoot Surgery

Editorial comment from Fred Robinson

As in all spheres of surgery, there is always a tension between our desire to reduce the size of the skin incision, minimising the soft tissue dissection and the need to ensure that the bony and soft tissue elements of the surgery are completed with accuracy. Foot surgery is no different and over the last few years foot and ankle surgeons have been debating the pros and cons of minimally invasive forefoot surgery. In the next two articles the pros and cons of minimally invasive surgery are debated. Of course there is no right answer but at least it helps to be better versed in the arguments!

For – Anthony Perera Co-authors Andy Molloy & David Redfern

The debate as to whether minimally invasive forefoot surgery is justified needs a frame of reference. Pitting everything done with a small incision against a few successful things done with a large incision, without consideration of the deep dissection, osteotomy, fixation, biomechanics and rehabilitation is illogical. All of these factors have much a greater bearing on the outcome than the superficial wound. For example, somewhat bizarrely the Hohmann osteotomy, rebranded as the Bosch or the SERI, now finds itself switching sides. It no longer counts as ‘open’ surgery, despite being an open approach done with a standard saw, just because it has a smaller cut and is skewered with a K wire.

For a scientific debate clarity is essential. This article is not a defense of the Bosch, SERI or Reverdin osteotomies, they did not work through a large hole and are no more useful through a small hole. Neither are they in anyway related to the percutaneous, fixed chevron osteotomy (MICA – minimally invasive chevron Akin) any more than the scarf is related to the Wilson, Mitchell or indeed Hohmann. Such diverse procedures would not be treated as a single entity just because they are all done with a saw. NICE guidance fails to recognise such distinctions.
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Nor is this a case for MICA supremacy. Whilst this is our preferred technique, bunion patients vary in numerous factors and it is therefore just one part of our armamentarium, which also includes the scarf osteotomies, amongst others.

Why can’t we just be satisfied with what we know?

To put it simply we have just not found an ideal surgical solution yet, far from it in fact. The variety of procedures and the lack of any universally agreed ‘gold-standard’ clearly demonstrates this.

The 2014 ‘A Systematic Review’1 found that there was insufficient evidence to comment on the effectiveness of both the Scarf and percutaneous osteotomy - including the MICA for which there were no randomised control trials (RCT). Only the open distal chevron osteotomy was found to be “likely to be beneficial and more effective than no treatment or ortheses”.

All techniques have complications. Up to 38% of Chevron patients had complications in one RCT. In another 10% were dissatisfied with the appearance, 10% had metatarsalgia and whilst there was better function and pain relief at one year there was no difference in the ability to work compared with no treatment! The Scarf fares no better and Coetzee in demonstrated in his paper “Scarf Osteotomy...the dark side”2.

Nevertheless, we know that generally problems related to the bone surgery are uncommon for any technique that follows the principles of bunion surgery as laid out by Barouk and others. On the contrary the commonest complaints are soft-tissue related such as stiffness and swelling. Unfortunately, these are largely under-reported as they are harder to measure. The reliance on x-ray parameters and the AOFAS score to determine the ‘success’ of surgery is a major failing of the literature.

What is the case for the Percutaneous, Fixed Chevron osteotomy (Or MICA)?

There has been very little change in the soft tissue element of bunion surgery for some time, if anything it has become more aggressive even though, the lateral release and the medial capsulorraphy all contribute to the overall insult. Yet soft tissue preservation is very important in foot surgery as it is in trauma surgery and the importance of this central tenet of the AO philosophy becomes more apparent if a first ray osteotomy is likened to a fracture. Thus a scarf osteotomy is more like a grade II or even III injury and the MICA more like a grade I.

We know that whatever osteotomy is used the bony part of the surgery is reliable. The question is whether the same basic principles of bunion surgery can be applied through a smaller surgical approach. This is not about cosmesis. It is about deep soft tissue complications (swelling, stiffness) and the superficial soft tissue complications (in one UK study of the scarf there was a 4% infection rate and a further 31% scar complication rate).

As MICA is in its infancy there is very little in print available for comparison, much like the scarf in its early stages. Perera’s series of two consecutive cohorts of open and percutaneous bunion corrections (primarily Chevron) based on ‘intention to treat’ was presented at BOFAS 20133. This showed equivalent bony correction but improved soft-tissue outcomes including infection, stiffness and functional outcome scores for MICA. There was a learning curve and this was primarily related to the fixation. Lam presented his results of a randomised trial on scarf versus MICA at BOFAS 20144, again demonstrating equivalent radiological results but improved soft tissue outcomes for MICA.

So what of the future?

Orthopaedics must constantly strive to improve and one should not write-off exploration of percutaneous surgery as the latest gimmick, or worse as just a marketing ploy, as this would fail to recognise the need to improve what we have. However, patient safety is paramount and trumps innovation, thus it is essential that patients are aware that MICA is a new procedure and that they understand the NICE guidance on the subject. There is a learning curve and it is not for everybody. This applies to both surgeon and patient. Thus it should only be performed by an appropriately trained expert and then only as part of audit and research, acknowledging the possibility that MIS may not be the answer.

This will only be possible if we collect data and monitor outcomes in scientific study. It will not come from both sides brandishing individual examples of poor outcomes. Of course, no other innovation (e.g. scarf, basal opening wedge and Tightrope procedures) has been subjected to this level of scrutiny and therefore it is clear that the evidence base of bunion surgery as a whole and not just minimally invasive surgery needs work.

Against – Dishan Singh & Adam Lomax

Minimally invasive surgery (MIS) for correction of hallux valgus (HV) is not justifiable. There is insufficient evidence to support its use and its historical failures should not be repeated.

Since the introduction of MIS for HV correction in the United Kingdom (UK) in the 1980’s, three main procedures have been used. Bosch described a linear osteotomy at the metatarsal neck, performed with a saw through a small vertical skin incision. An intramedullary k-wire was then used to plate and hold the metatarsal head laterally5. Using his own modification of this technique Giannini published good results, but these results were not matched elsewhere6. Myerson abandoned the procedure after observing dorsal mal-alignment in 68% of cases and a recurrence rate of 38%7. Magnan reported a mal-alignment rate of 25.5%, Huang showed a poor radiographic result in up to 63.9% of cases and Ianno observed an overall complication rate of 29.4%8. This technique has now largely been abandoned in the UK.
A second technique, the Reverdin-Isham osteotomy involves an intracapsular osteotomy performed with a burr through a percutaneous incision. The correction was achieved through a medial closing wedge osteotomy of the head, decreasing the distal metatarsal articular angle. No internal fixation was used. The result was shortening of up to 9mm along with non-congruence of the 1st MTPJ in up to 47% of cases. This technique has also largely been abandoned throughout Europe.

A third MIS technique then emerged; the Minimally-Invasive Chevron-Akin (MICA). This is advocated by approximately 15 surgeons in the UK today. Again however, it has a track record of problems. The fixation, performed initially with one screw was inadequate. Subsequent attempts, next with two dorsal screws and then with two short medial screws also proved insufficient. Now in its 4th generation, fixation using two long screws from the medial side is currently favoured.

There have been articles promoting MICA in the national press, generating public interest with claims of good long-term results, reduced swelling and pain and earlier return to function. This may be headline grabbing and attractive to patients, but medicine must remain evidence based. These publicised results and early post-operative benefits have not been substantiated with robust clinical evidence. Importantly, the good published results for HV correction with open chevron osteotomy should not be transferred to the MICA technique because the surgery is very different.

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at most, since the head translation should be no more than 50% of its width to maintain stability

A lateral soft tissue release, when required is always performed before the osteotomy to allow relocation of the sesamoids as the head is translated laterally. Finally, a medial capsular plication is performed to address the attenuated medial soft tissues. For the MICA technique, bony cuts are made percutaneously with a burr using x-ray guidance. The cuts that are made are inaccurate having been shown to be out-with the surgeon’s intended orientation in 100% of cases. The burr is thicker than the saw, meaning that bone loss is more pronounced and metatarsal shortening occurs. Furthermore, the burr causes severe damage to the bone such that bone healing is not faster simply because the skin incision is small. Subsequent displacement of the head is frequently beyond 50%, even 100% in cases of more severe deformity. The lateral release is always performed at the end of the procedure, after the head translation and not before. The medial soft tissue attenuation is not addressed.

It is clear that the MICA procedure is not the same as the open operation, but for the fact that the bone cuts are performed percutaneously and with a burr. This is a completely different surgical procedure, which must be evaluated for outcomes in its own right. The only evidence available for the good outcomes of MICA comes from short-term follow up (mean 3-7.5 months) of small cohort groups, without comparison or control. All of these studies come from technique-originator data, in abstracts submitted to scientific meetings. It remains unpublished in peer-reviewed literature. In fact, similar unpublished evidence presented recently from a non-originator surgeon who has now abandoned the technique showed a complication rate of 27%. There are no comparative trials to prove that MICA delivers any of the suggested benefits over open techniques. It is unsurprising therefore, that two systematic reviews have failed to recommend the use of MIS surgery over open techniques for the correction of HV.

In summary, assuming equivalence in long-term outcomes for MIS surgery and open techniques is flawed. The suggested additional advantage of improved early postoperative recovery is not evidence based. The published evidence in MIS for HV correction shows an increase in complications and a record of failure. Until well-conducted comparative trials show proven outcomes and beneficial results from this technique, we must not recommend it to our patients.

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