

Comment to the paper “Balloon reduction and cement fixation in intra-articular calcaneal fractures: a percutaneous approach to intra-articular calcaneal fractures” by Jacquot et al.

Frederic Jacquot · Arthur Atchabahian ·
Thomas Letellier

Received: 23 June 2011 / Accepted: 24 June 2011 / Published online: 13 July 2011
© Springer-Verlag 2011

Dear Sir

We read with interest the comments and questions by Zhao et al. on our paper titled “Balloon reduction and cement fixation in intra-articular calcaneal fractures: a percutaneous approach to intra-articular calcaneal fractures” [1] and we wish to bring some clarification to the matter.

First, it is our understanding that open reduction and internal fixation (ORIF) through a lateral approach, the procedure now considered standard treatment, is a difficult technique and plagued with many problems, not the least of which is soft-tissue involvement. Obviously, the more violent the trauma to the bone and soft tissue, the more articular fracture comminution interferes with the achievement of a satisfactory clinical result using the standard technique. Thus, we believe the technique we used in our series avoids the difficulties of standard ORIF.

We agree that not only is articular reduction important in joint-depression calcaneal fractures, but restoration of the height and shape of the os calcis is mandatory, as pointed out by other authors [2]. This is why we used not only the balloon technique but other restorative measures, such as lateral compression and temporary plantar cortical wire fixation, to help reduce the bone percutaneously. Restoring

the general shape of the bone may be much more important than joint reduction alone. In case 2 in our series [1], a small central fragment was left unreduced. This was corrected percutaneously without trauma to the soft tissue. Knowing whether a better reduction would have been achieved through an extensive approach remains conjectural but is not warranted. Accurate joint reduction is difficult to achieve with the balloon technique; it is also difficult to achieve and maintain with regular ORIF. In short, comminuted joint fractures may not be a contraindication to the balloon technique, but to the contrary may be an indication.

In the paper by Gupta et al. [3], severe limitations in the amount of displacement were imposed on the use of the authors’ technique: only minimally displaced ($<5^\circ$) varus calcaneal fractures were treated. The authors used a percutaneous balloon technique and filled the void using a phosphocalcic compound, which appears to offer no fracture stabilisation properties. We described a percutaneous balloon reduction technique, and do not see the point in using such technique in undisplaced calcaneal fractures and bone filling with a weak compound such as phosphocalcic cement. In our experience, such fractures may be better treated nonoperatively, as is the current recommendation, with good clinical results. Percutaneous techniques already allow varus fracture reduction through lateral compression and percutaneous temporary pin fixation. Other techniques may be necessary or may need to be fine tuned [4]. We favour the use of temporary reduction techniques and fixation using polymethylmethacrylate (PMMA) only to avoid later need for hardware removal and the risks involved with infection and skin breakage in a swollen foot. A matter that was not discussed in our paper was operative timing: reduction may be much easier or more

F. Jacquot (✉) · T. Letellier
Department of Orthopedics, Hôpital Saint Antoine,
184 rue du Faubourg Saint Antoine,
75012 Paris, France
e-mail: frederic.jacquot@sat.aphp.fr

A. Atchabahian
Department of Anesthesiology, NYU Hospital for Joint Diseases,
New York, NY, USA

effective when performed as an emergency procedure, a procedure that may be possible using percutaneous techniques in a highly swollen heel fracture. The trend for late operation (as much as three weeks posttrauma) to minimise the risk of skin breakage may render accurate reduction much more difficult, even with ORIF, and necessitate a more extensive, vascularisation-stripping, lateral approach.

In all, our view is that we are in the process of enlarging our concepts regarding calcaneal fracture treatment by using a collection of new tools that may improve the final clinical results we offer to our patients and diminish the risk of iatrogenic skin breakage in these difficult fractures.

Best regards

References

1. Jacquot F, Atchabahian A Balloon reduction and cement fixation in intra-articular calcaneal fractures: a percutaneous approach to intra-articular calcaneal fractures. *Int Orthop*. doi:[10.1007/s00264-011-1249-z](https://doi.org/10.1007/s00264-011-1249-z)
2. Magnan B, Samaila E, Regis D, Merlini M, Bartolozzi P Association between ct imaging at follow-up and clinical outcomes in heel fractures. *Musculoskelet Surg* 94 (3):113–117. doi:[10.1007/s12306-010-0081-8](https://doi.org/10.1007/s12306-010-0081-8)
3. Gupta AK, Gluck GS, Parekh SG Balloon reduction of displaced calcaneus fractures: surgical technique and case series. *Foot Ankle Int* 32 (2):205–210. doi:[10.3113/FAI.2011.0205](https://doi.org/10.3113/FAI.2011.0205)
4. Tomesen T, Biert J, Frolke JP Treatment of displaced intra-articular calcaneal fractures with closed reduction and percutaneous screw fixation. *J Bone Joint Surg Am* 93 (10):920–928. doi:[10.2106/JBJS.H.01834](https://doi.org/10.2106/JBJS.H.01834)