Pre-operative templating in total ankle replacement

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Disclosure

NO CONFLICT TO DISCLOSE

Pre-operative templating in total ankle replacement Arthrodesis

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Our disclosures are in the Final AOFAS Mobile App.

We have no potential conflicts with this presentation.
Background

• Total ankle replacement (TAR) is a relatively uncommon joint replacement procedure.
• Only 631 TAR operations were performed in the UK in 2014. (1)
• Popularity is increasing as a suitable alternative to ankle fusion in patients with end stage ankle arthritis. (2)

• Pre-operative templating using plane radiographs is of great importance in planning arthroplasty of the hip and knee. (3) Its role in total ankle arthroplasty (TAR) is less clear.

• It is hypothesised that:
  – Being able to use the best fitting implant is of paramount importance for transferring loading forces through the ankle joint.
  – This may contribute to the longevity of the TAR prosthesis.

• It is unclear whether pre-operative templating is more accurately performed using an AP radiograph or 3-Dimensional (3D) imaging using MRI or CT.
Templating

- The objectives of digital templating are:
  - to improve the preoperative planning in order
  - to reduce intraoperative errors concerning implant sizing, alignment and fit
  - giving the opportunity to prepare excess components for the operation room.

- A cost efficiency would be seen by reducing the surgical trays used

- Our Aim was to compare the accuracy of preoperative templating using an AP radiograph versus 3-Dimensional imaging using a CT/MRI, in predicting the size of the implanted prosthesis.
Methods

• Patients undergoing TAR with BOX® mobile bearing prosthesis (MatOrtho™, Surrey, UK) between July 2014 and September 2015 were included in the study.

• Data was collected prospectively using a TAR database and included:
  – Patient demographics
  – The implant size used for both Tibial and Talar components (small, medium or large) and the polyEthylene liner size.

• Although pre-operative AP radiograph templating had been performed and recorded on the database we reviewed all Imaging and re-templated retrospectively using the INFINITT® PACS system

• All images had been appropriately calibrated

• Patients were included in the study if they had undergone pre-operative plane radiographs and 3-Dimensional imaging such as an MRI or CT

• Patients were part of an on-going clinical trial which has ethics committee approval
Templating

• To overcome both inter-observer and intra-observer bias these scans were:
  – Reviewed retrospectively by two separate authors (AF and JG) assessing for:
    • Tibial and Talar width on the AP radiograph (figure 1).
    • Tibial and Talar width in the Coronal plane at the midpoint of the Tibia in the Sagittal plane (figure 2).
  – The measurements were repeated after one month with the patients randomised and the authors blinded to the previous measurements.
  – A third author (MS), the lead surgeon, resolved any disagreements on measurements.
  – The authors were blinded to the implant size used.
Figure 1. Tibial and Talar Width on AP Radiograph
Figure 2. Tibial and Talar Width on MRI
Results

• 29 patients undergoing TAR with BOX™ TAR between July 2014 and September 2015 were identified for potential inclusion in the study.

• 26 patients in this cohort underwent pre-operative CT or MRI assessment and were suitable for inclusion in the study (CT=6, MRI =20).

• Templating the Tibial width on AP radiograph predicted the implant size 33.7% of the time while using CT/MRI scan predicted the implant size correctly 60.6% of the time.

• Templating the Talar width the AP radiograph predicted the implant size 46.2% of the time while using CT/MRI scan predicted the implant size correctly 66.4% of the time.

• The odds ratio for CT/MRI predicting the implant correctly over the AP radiograph was 3.02 (CI = 1.7 – 5.3) for the tibial component and 2.14 (CI = 1.22 – 3.7) for the Talar component.
  – These values were statistically significant (P<0.05)
Conclusion

• Templating the pre-operative images we found 3D templating with an MRI or CT scan to be significantly more accurate for predicting correct implant size, compared to an AP radiograph.

• We advise the use of MRI or CT as the most effective way to plan for TAR. MRI and CT are now frequently performed in orthopaedic centres as routine investigations.

• These modalities have the added benefit of assessing surrounding joints and soft tissues to aid accurate diagnosis.

• The limitations of this study lie in the small sample size and the retrospective methodology.
1. Registry NJ. National Joint Registry > Healthcare providers > Accessing the data > StatsOnline > NJR StatsOnline. 2015.
