The Teardrop Technique – Safe and Easy Iliac Screw Placement

C. Birkenmaier ¹, A. Unverzagt ², C. Melcher ¹

¹: Department of Orthopaedics, Physical Medicine & Rehabilitation, University of Munich, Grosshadern Campus
Marchioninistr. 15, 81377 Munich, Germany

²: Anatomical Institute, University of Munich, Chair 1 – Vegetative Anatomy
Pettenkoferstr. 11, 80336 Munich, Germany
Background 1

- Iliac Screws (IS) play an important role in complex spine surgery
- IS placement may be challenging for novice spine surgeons
  → risk of malpositioning and injury to nerves / vessels / hip joint
- placement according to anatomical landmarks requires wide exposure and an iliac crest osteotomy to recess screw heads
  → risk of wound healing problems, seroma, infection
- placement without osteotomy risks prominent screw heads
  → risk of pressure sores, pain, perforation

**In consequence:** Recommendation by some authors to use navigation \(^1,2\) or trans-sacro-iliac trajectories (S2-iliac screws) \(^3,4\)

Background 2

Own Experience: using intraop C-arm projection of the iliac teardrop and a Jamshidi needle / flexible guide wire, IS can be placed rather easily, without additional exposure below the S1-screw and without the need for offset connectors.
Study Objective

To evaluate in a correlative experiment (anatomy vs. virtual 3D-imaging):

• whether the teardrop landmarks indeed constitute the iliac cortices
• whether screws placed within these landmarks are fully contained within the ilium
Materials & Methods 1

• based upon anatomic studies of the iliac bone’s geometry \(^5\) and a published technique for percutaneous placement of S2-iliac screws \(^6\)

• anatomic specimen: internal and external iliac cortices marked with wire segments (2, short = internal, long = external) and the SIJ (1). "A" represents the empty acetabulum

Materials & Methods 2

- adjustment of C-arm for optimum teardrop projection as in real surgery
C-arm guided localization of the “ideal” starting point as in clinical application

navigation-CT-scan of the pelvis with marking wires in place

simulation of multiple IS-placements (9 x 100 mm) using 3-D surgical planning and navigation software (SpineAssist, Mazor Robotics) and using the identical starting point

3-dimensional analysis of screw positions
Results

• simulated and projected (C-arm) teardrop figures were identical
• all simulated IS were positioned completely within ilium (a: oblique coronal, b: axial, c: oblique sagittal)
• these trajectories were very reproducible
Conclusions

- teardrop technique is safe and easily applied
- no relevant learning curve beyond adjusting the C-arm
- minimal technical demands (carbon table without side rails, C-arm, Jamshidi needle)
- ideal for beginners with pelvic fixation
Thank You
Disclosures

• no funding in context with this work

• no competing interests

• no financial relationships

• personally managed stock ownership in EOS Imaging (Birkenmaier)