

“Channel Lines”: A Simple Surgical Technique to Aid in Achieving Patient-specific Ante-version During Implantation of Uncemented Acetabular Cups

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Summary: Accurate acetabular cup placement is a crucial step for a successful total hip replacement. Transverse acetabular ligament is an important and reliable landmark that helps in determining the version during the placement of acetabular cups. However, the visualization of transverse acetabular ligament may not be easy as the view may be blocked by the implants and the instruments. We have devised a simple technique to aid in achieving patient-specific ante-version during implantation of uncemented acetabular cups by using “channel lines.”

Key Words: surgical technique—ante-version—acetabular cups—total hip replacement.

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Cup positioning is an important variable for short and long-term function, stability, and durability of total hip arthroplasty.¹ Transverse acetabular ligament (TAL) can be used to determine the position of the acetabular component.² It defines the version of acetabular component without the need for external instrumentation and is independent of the position of the patient.³ Aligning the acetabular component parallel to the TAL enables establishment of patient-specific ante-version and decreases the dislocation rate.⁴ Visualization of TAL could be obstructed during implantation of the acetabular cup by the cup itself and also by the instruments. The final position of the cup in relation to the TAL may not be fully appreciated till the cup is fully seated and if not parallel to the TAL the cup may have to be removed and reintroduced. We devised a simple surgical technique that would help the surgeon to place the cup parallel to TAL even if the view of the TAL was obscured during implantation.

SURGICAL TECHNIQUE

Identify the TAL (Fig. 1). The reamer is placed in the acetabulum and reaming performed in a sequential manner making sure that the reamers are parallel to the TAL (Fig. 2). While using the last reamer, 2 marks (Fig. 3) are made with diathermy at the distal edge of the wound in the fat layer/soft tissues with reference to reamer handle so that the lines are

perpendicular to the TAL. Care is taken not to move the leg once the marks are made so that the position of the marks are not distorted.

The lines were called the “channel lines.” No inferior retractors were used. The definitive uncemented cup is introduced with the introducer, making sure the introducer follows the channel between the marks (Fig. 4) so that the cup is parallel to the TAL. Because these lines are a good reference for the cup to be seated parallel to the TAL, the surgeon could place the cup even if the visualization of the TAL was obscured during implantation (Fig 5). Confirm the final position of the cup which should be parallel to TAL, indicating the achievement of patient-specific ante-version (Fig. 6).

DISCUSSION

In spite of a growing recognition of the importance of cup position, studies have noted relatively poor accuracy of manual component positioning.⁵ The position on the operating table,

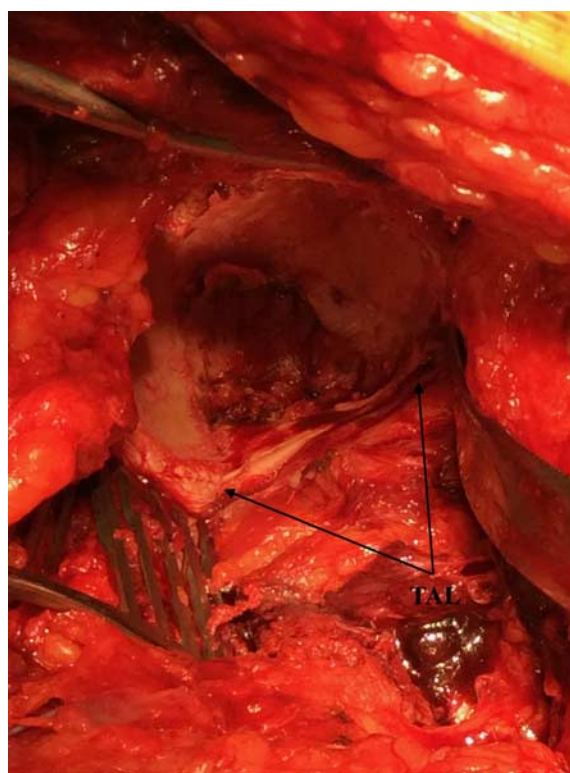


FIGURE 1. Identify transverse acetabular ligament (TAL). Arrow indicates transverse acetabular ligament. [full color online](#)

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The authors declare that they have nothing to disclose.

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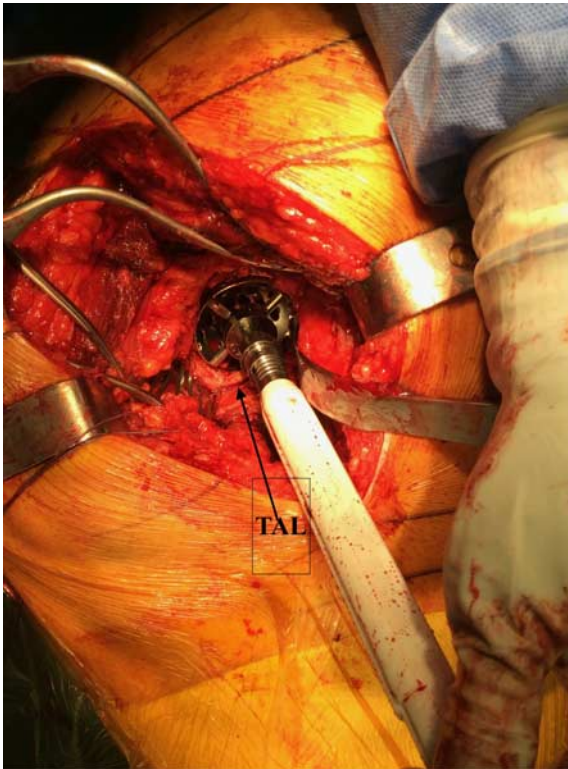


FIGURE 2. Reamer parallel to transverse acetabular ligament (TAL). Arrow indicates that the reamers are parallel to TAL. [full color online](#)

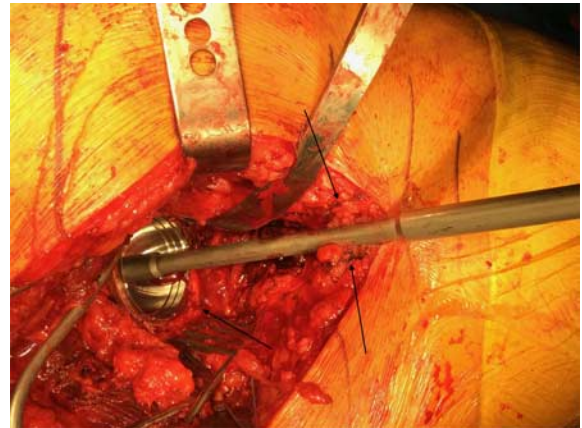


FIGURE 4. Introducer following the channel lines. Arrow indicates introducer between the lines. [full color online](#)

the dislocation of the native hip and the use of retractors may alter the pelvis and thus, the acetabular version.⁶ There is a good evidence for the use of TAL in terms of accuracy of acetabular component ante-version and that the dislocation rate using this technique was low but it must be stressed that the cause of postoperative dislocation in total hip arthroplasty is multifactorial and cannot solely be attributed to acetabular component orientation.⁷

Although navigation technology has been shown to significantly improve precision during insertion of the acetabular component, the additional cost and increased duration of

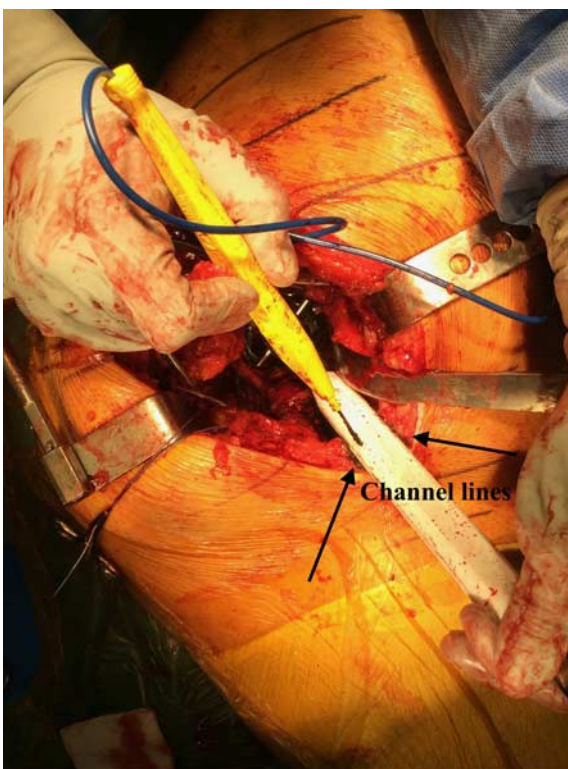


FIGURE 3. Marking “Channel Lines” along the reamer handle. Arrow indicates channel lines. [full color online](#)



FIGURE 5. Guiding the cup ante-version even without direct visualization of transverse acetabular ligament. [full color online](#)

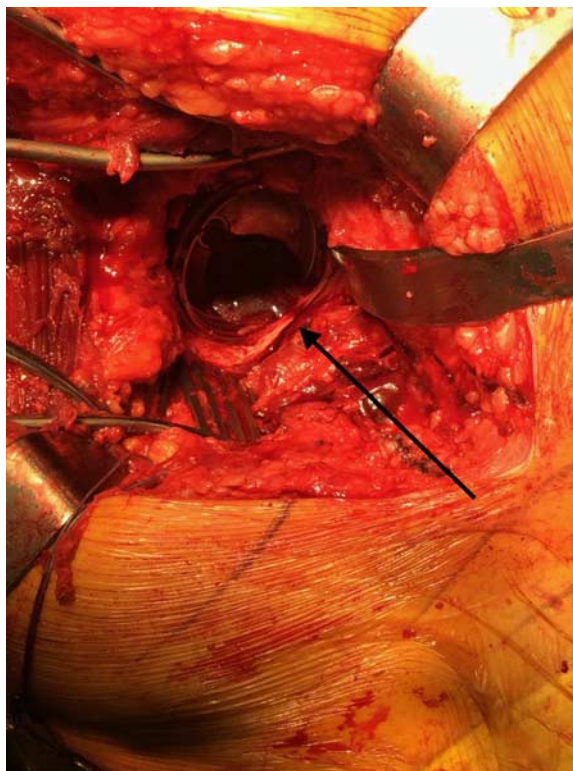


FIGURE 6. Final cup position parallel to transverse acetabular ligament. Arrow indicates cup sitting parallel to TAL. [full color online](#)

surgery has prevented the widespread uptake of these techniques.^{7,8}

Our simple surgical technique aids in attaining accurate patient-specific ante-version of uncemented cups. TAL is used as a guide to acetabular reaming and the 2 lines with diathermy made in the fat layer/soft tissue at the distal aspect of the wound along the reamer handle. This provides a channel that gives a good reference for subsequent reaming and implantation of definitive cup. In our technique care is taken not to move the leg from once the mark is made till implantation of the cup. This is to avoid any distortion to the reference lines. It is important to draw the lines while using the last reamer and this is just moments before the implantation of the acetabular shell. It is therefore absolutely possible to keep the limb at the same position and not moved till the cup is fully seated.

While implanting the acetabular cup, the view of the TAL could be obscured due to bulky implant or the surrounding instruments. By using our “channel lines,” it guides the surgeon to the correct position of the cup parallel to the TAL even if the view is obscured. This also helps to avoid placing the inferior retractor below the TAL which can risk injuring the obturator nerve.⁹ By using TAL, it helps to achieve patient-specific ante-version of the cup, independent of patient position.³ This technique has limitations as this may not be reliable where a significant acetabular structural abnormality is present, as in severe dysplasia or following a pelvic fracture.² In our practice we have noticed that in dysplastic hips and retroverted hips TAL orientation has large individual variation and is influenced by the pathology but still is a useful landmark and a starting point for referencing. The cases that we have found most

challenging and following the TAL, least reliable, are the ones with an old conservatively treated pelvic or acetabular fracture where the abnormality is traumatic rather than developmental; our approach and surgical steps remain the same in all cases. For acetabular ante-version we follow the TAL in all cases including complex primaries. For inclination we preoperatively template aiming for 35 to 45 degrees. Intraoperatively we measure the uncovered superolateral arc of the acetabular shell and compare it with our plan. For femoral stem version we aim to be parallel to the posterior femoral neck. After trial reduction we sequentially assess and adjust the leg length, the offset, anterior stability, and posterior stability. We subsequently fine tune and reposition the acetabular implant for maximum range of movement of the joint and stability.

For cases with native acetabular retroversion in particular, we very rarely had to orient the cup in a version other than parallel to the TAL. In 2% of all cases the final version of the cup was not parallel to the TAL. We follow a standardized, algorithmic approach for all our cases and address problems with stability as they arise, on an individual basis.

CONCLUSIONS

Our simple surgical technique of using channel lines aids in achieving patient-specific ante-version during uncemented acetabular cup implantation. It's a simple, safe, reliable, and reproducible technique that helps to use TAL as the intra-operative landmark for ante-version and thereby achieving optimal cup implantation and restore the individual anatomy of hip joint.

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