Letters to the editor

Condyle screws


We would like to comment on this paper and point out that the statement “the occipital condyle has never fully been studied as a viable structure that in itself could permit adequate purchase by fixation devices” is inaccurate. Gonzalez et al., in a previous anatomical study published in 2001, elucidated the possibility of fixing the craniovertebral junction using the occipital condyles as a fixation point. In 2003 in cadaveric studies, Gonzalez et al., and Dvorak et al., using, respectively, posterior and anterior cervical transarticular approaches demonstrated the feasibility of using the occipital condyles as a fixation point. Based on those studies we agree with the authors’ statement that the condyle can provide enough solid purchase to permit insertion of a screw vertically up into the condyle through a caudal–rostral trajectory. However, a similar technique in which the occipital condyles were fully studied as the sole cranial fixation point in craniocervical arthrodesis that the condyle can provide enough solid purchase by fixation devices is inaccurate. Based on those studies we agree with the authors’ statement that the condyle can provide enough solid purchase to permit insertion of a screw vertically up into the condyle through a caudal–rostral trajectory. However, a similar technique in which the occipital condyles were fully studied as the sole cranial fixation point in craniocervical arthrodesis that the condyle can provide enough solid purchase by fixation devices is inaccurate.

We would like to point out a few critical differences between our technique and that described by La Marca et al.

La Marca et al. describe their technique as follows: “Occipitocervical musculature was stripped in a subperiosteal fashion from the occipital bone and lamina of C-1 and C-2. The VA [vertebral artery] was skeletonized out laterally and the posterior aspects of the occipital–C1 joint capsule exposed. The condylar emissary vein foramen, the occipital–C1 joint capsule, and the foramen magnum were identified and considered rostral, caudal, and medial anatomical landmarks, respectively.”

We do not recommend skeletonization of the VA; instead we have applied successfully in our cadaveric studies and in our clinical cases a safe technique for VA exposure that involves blunt interfascial dissection in the plane between the muscles and the periosteum of the posterior arch of the atlas. This allowed preservation of the dense vertebral venous plexus and led to bloodless exposure of the condylar entry point at the condylar fossa and its junction with the occipital condyle. Another key aspect of our technique is the identification of the posterior emissary condylar vein, which in our method defines the lateral extent of the dissection.

In the technique of La Marca et al., the entry point is dictated by the following anatomical landmarks and navigation image assistance as: “3 mm inferior to the condylar emissary vein foramen along the midline of the condyle itself. The drill was angled 30° inferiorly to insure safe clearance of the hypoglossal canal and 10° medially to insure safe clearance of the jugular foramen.”

Using a combination of radiographic and anatomical landmarks, we define an entry point located at the condylar fossa, named the condylar entry point (CEP). The CEP is located 4- to 5-mm lateral to the posteromedial edge of the condyle at its junction with the occipital bone at the condylar fossa (Fig. 1). Our technique involves making pilot holes at the CEP using an awl with slight rostral angulation to avoid injury to the horizontal segment of the VA. The pilot hole is then drilled in a convergent trajectory with 12°–22° of medial angulation and 5° cranial angulation in the sagittal plane with the tip of the drill directed toward the basion. The drilling is accomplished with guidance from intraoperative landmarks and lateral fluoroscopic imaging, advancing slowly until the anterior cortical edge of the condyle is breached. Using this trajectory we have placed successfully 24 condyle screws without injury to the vascular or neural structures, obtaining the biomechanical benefits of bicortical screw purchase. Placement of the screws in a convergent trajectory (12°–20°), decreases the risk of carotid artery injury, and allows safe bicortical purchase. We safely used 30- to 32-mm length screws with 20–24 mm of bicortical condylar purchase, which may decrease complications related to unicortical screw purchase. Approximately 12 mm of the unthreaded portion of the screw remained superficial to the posterior cortex of the condyle, allowing the polyaxial portion of the screw to lie above the posterior arch of C-1 in order to avoid compression of the VA by the rods. We believe that the occipital bone at the region of the condyle makes it difficult to angle the drill 30° inferiorly. This trajectory may require flexion of the head, more soft tissue exposure laterally and superiorly to the occipital condyle, and total dissection and exposure of the condylar emissary vein, including skeletonization of the VA, posing a significant threat to the vascular structures and risk of violation of the occipital condyle–C1 articular surface.

We agree with the authors’ statement “The disadvantages of our technique are intrinsic to the proximity of the hypoglossal canal and the jugular foramen. However, good knowledge of the anatomy, careful preoperative planning, and adequate exposure in and around the occipital condyle decreases the risk of lesions to these structures.” On the other hand, surgical exposure in the clinical setting would obviously be more technically challenging because the venous plexus surrounding the VA can be quite cumbersome.

We concur with the authors that it appears that ana-
tomical reference points may be sufficiently reliable to guide screw placement. However, the use of fluoroscopy/image guidance and intraoperative electromyographic nerve monitoring may be necessary, especially during the early phases of clinical trials, to ensure safe screw placement.

We have used our technique in 3 clinical cases with success. A case report is in process, and the biomechanics of this construct have been submitted to a peer-reviewed journal.

The evolution of this novel transcondylar screw placement is still in its infancy, and we hope that others will work closely in collegiality to enhance its potential development in the future so that we can include this in our armamentarium when dealing with complex cases requiring occipital-cervical fusion.

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Disclosure

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References


RESPONSE: We thank the authors for their thoughtful critique of our paper; however, we take exception to some of the comments made.

We would like to point out that the papers cited by the authors were indeed credited and referenced in our paper.1–4 These studies represent an important contribution to our understanding of the occipital condyle as a structure suitable for transarticular fixation. However, a casual review of our paper would reveal that the focus is on the concept of segmental fixation, which had not previously been described in any detail. In fact, we (D.K.) have had

Fig. 1. Posterior view of the occipital cervical junction showing the location of the CEP.
the occasion to debate the merits of transarticular fixation versus segmental fixation with the senior authors (C.A.D. and V.K.H.S.) of one of the papers cited. In addition, we first presented a paper on “Occipital Condyle Screw Fixation” at the Congress of Neurological Surgeons Annual Meeting in Philadelphia in 2002 (G Zubay, T Morrison, S Ondra, et al., presented at the Annual National Meeting of the Congress of Neurological Surgeons, 2002), which was not referenced in the publication by Uribe et al.

With respect to the work by Uribe et al., we regret that we were not aware that the method described was presented at the Southern Neurosurgical Society Meeting (Puerto Rico, 2008). However, our paper was submitted several months before the date of that presentation, and published 2 months before the Uribe et al. paper appeared in the Journal of Spinal Disorders & Techniques.

In response to the authors’ comments regarding our proposed surgical technique, we would like to underscore that our paper was an anatomical study of the feasibility of the occipital condyle to accommodate segmental screw purchase, and the effects of that screw placement on surrounding anatomical structures. The manuscript was not a clinical description of a surgical technique in vivo. Radiographic volumetric analysis was performed along with anatomical dissection and neuronavigational planning to determine optimal screw trajectory. This is substantially different from the data described by Uribe et al., who assessed anatomical results based on dissection, and placed screws with a wide degree of variability in trajectory based on surgeon technique and fluoroscopic imaging.

Nonetheless, we appreciate the summary of their work, acknowledge the feasibility of the technique described as a potentially viable alternative to our technique, and look forward to their forthcoming publication on the biomechanics of and their clinical experience with this construct.

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