
In this article, the authors presented 5 patients with Levine–Edwards Type II hangman’s fractures that were treated with minimally invasive percutaneous screw fixation. Initial conservative treatment had failed in 3 patients, was impossible due to neck lacerations in 1 patient, or was likely to fail because of noncompliance to wearing the rigid collar in 1 patient.

We agree with the authors that in these cases there is a good indication for transpedicular screw fixation. Until now, we have performed a similar procedure in 3 patients with Type II hangman’s fracture. However, in contrast to the procedure described by Buchholz et al., we placed the screws with neuronavigation (O-arm, Medtronic) using a small (6-cm) midline incision (Fig. 1). In our opinion, this procedure has the advantage that the screws can be placed minimally invasively with direct view of the entry point and anatomical landmarks. The frame for the navigation was placed on the spinal process of C-3 to prevent distortion of the navigation, which might occur if the frame is placed on the spinal process of C-2. A small skin retractor is used (Fig. 1B) to achieve maximal mobility of the skin and muscles during the screw placement. In our opinion, this procedure is safer than that described by Buchholz et al., because the screw can be placed with direct vision of the entry point in the pedicle and the associated anatomical landmarks. This approach will also result in better control of a possible intraoperative neurovascular complication. Moreover, the size of the incision is more or less the same as the total of 2 lateral stab incisions, as is the total duration of surgery and postoperative time in the hospital.

In addition, we want to advocate the use of lag screws to reduce the fracture displacement. Buchholz et al. mentioned the use, but did not specify in how many cases and why in these cases lag screws were used. We used lag screws in all 3 of our cases, which resulted in early ossification, 3 months after the surgery. An example is provided in Fig. 2.

Finally, we would advise that preoperative MRI be performed in all cases of hangman’s fracture to document 1) potential rupture of the C2–3 intervertebral disc (even in

FIG. 1. A: Navigated placement of a transpedicular C-2 screw in a case of Type II hangman’s fracture using a small midline incision with direct vision of the screw entry and anatomical landmarks. B: Intraoperative trajectory on the monitor of the navigation system. Figure is available in color online only.

FIG. 2. Transverse CT scans obtained in a 47-year-old woman who was referred to us in 2013, 1 week after a car crash. A: Preoperative image showing a 3-mm fracture displacement. B: Postoperative image demonstrating reduction of the fracture site. C: Follow-up image after 3 months showing complete ossification across the fracture site.
the absence of angulation), 2) possible dissection of the vertebral artery, and 3) the presence and degree of posterior ligamentous injury. In case of rupture of the C2–3 intervertebral disc, there is a high risk for secondary angulation. If so, we would favor C2–3 anterior cervical discotomy with fusion. In cases of unilateral dissection of the vertebral artery we would also perform C2–3 fixation (either anterior or posterior), because of potential contralateral injury in transpedicular screw placement. In case of posterior ligamentous injury, the patient is advised to wear a hard collar for 3 months. Follow-up should be at least 1 year to exclude late-onset C2–3 instability by dynamic radiography.

Although Buchholz et al. presented an interesting case series of minimally invasive percutaneous transpedicular screw placement for Type II hangman’s fractures, we do not agree that the advantages of percutaneous placement outweigh the risk of potential neurovascular injury. We presented an alternative minimally invasive procedure, which has the advantage of direct vision of the screw entry point and associated anatomical landmarks.

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References

DISCLOSURES
Dr. Arts reports the following: consultant for Biomet, InSpine, and Silony; support of non-study-related clinical or research effort from Amerdica and Biomet; and patent holder with EIT.

Response
We thank Drs. de Ruiter and Arts for their interest in our article and for raising several important points of discussion. Initially, we began screw fixation of hangman’s fractures through the use of open midline incisions, much in the way these authors describe; however, in an effort to reduce the blood loss and postoperative pain associated with this approach, we transitioned to percutaneous screw placement.

We agree that there are risks of neurovascular injury during any posterior cervical spine procedure, open or minimally invasive, and careful attention must be placed on anatomy and technique. Neither their group nor ours reported vertebral artery injury in the small series, but the possibility exists regardless. We disagree with several points raised by Drs. De Ruiter and Arts. First, we doubt that being able to directly visualize the bony surface through the described minimal open incision significantly decreases these neurovascular risks or gives the surgeon a better chance of fixing an injury. Repairing a laceration of the vertebral artery would require a larger exposure than either group describes in order to expose the vertebral artery in or near the foramen transversarium for proximal and distal control as well as suture repair. In addition, it is a matter of debate whether open or minimally invasive techniques have a higher risk of neurovascular injury. Finally, a 6-cm incision is significantly larger than the 2 stab incisions we describe. We do, however, agree with the utility of MRI in the evaluation of hangman’s fractures as well as the usefulness of lag screws and technique.

The use of neuronavigation has been advantageous in allowing surgeons to more accurately place screws with less dissection through both open and percutaneous approaches. The goal of our paper was not to show superiority of a procedure but rather a new approach to an old problem. The patients presented by Drs. de Ruiter and Arts were treated using less invasive open procedures made possible by advancements in neuronavigation, and we are glad to see continued progress in minimizing surgical interventions.

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INCLUSIVE WHEN CITING
Published online December 11, 2015; DOI: 10.3171/2015.7.SPINE15831.
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Treatment of subaxial cervical facet dislocations

TO THE EDITOR: It is with great interest that I read the article by Park et al. (Park JH, Roh SW, Rhim SC: A single-stage posterior approach with open reduction and pedicle screw fixation in subaxial cervical facet dislocations. J Neurosurg Spine 23:35–41, July 2015). This is interesting clinical research, and I believe the technique mentioned in the article can be an alternative to other techniques in some cases. However, I have some concerns.

First, cervical pedicle screw insertion is a technically demanding procedure that not every surgeon can perform because of the small diameter of the pedicle, and the risk of artery and nerve injury is greater than it is when performing mass screw placement.1–4 In the authors’ cases, lateral mass screw conversion occurred when placing 5 pedicle screws, and lateral pedicle wall perforation occurred when placing 5 screws (total unsatisfactory rate 11.9%, 10 of 84). Thus, this technique may be limited in its application. As we all know, lateral mass screw placement is safer than cervical pedicle screw fixation and anterior decompresion is more effective than posterior decompression, and combining the two requires 2 hours, which is similar to the operative duration reported by the authors (mean 133.3 ± 33.42 minutes). So, why not replace a more difficult and risky procedure with the safer and simpler posterior lateral mass screw fixation and anterior cervical discectomy and fusion?2 Of course the cost of the latter operation will be much higher.

Second, bilateral facet joints were destroyed during posterior decompression in 3 patients, and the load was totally subjected to the pedicle screws and rods without