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Research Article

Lag Pedicle Screw Fixation Technique for Hangman's Fracture

Asılı Adam Kırıklarında Posterior Pedinkül Lag Vida Tekniği

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ÖZET

Amaç: Kliniğimizde yapılan Asılı adam kırığı tip 2 ve 2A kırıkları için yapılan posterior pedinkül lag vida tekniğinin literatür ile karşılaştırmalı olarak değerlendirmeyi amaçlıyoruz.

Materyal ve Metot: 2017 ve 2020 yılları arasında posterior C2 pedinkül lag vida yöntemiyle 7 Asılı adam kırığı hasta ameliyat edildi. 6'sı erkek 1'i bayan olan hastaların yaş ortalaması 32.6'ydı ve hiçbir hastamızda servikal kırık dışında başka bir patoloji yoktu.

Bulgular: Ameliyat edilen 7 hastada post-operatif komplikasyon görülmedi. Bütün hastaların takiplerinin 3'üncü ayında kırık hattında kemikleşme görüldü. Vida malpozisyonu ve yanlış kaynama görülmedi.

Sonuç: Asılı adam kırıklarından tip 2 ve 2A olan hastalarda posterior pedikül lag vida fiksasyon tekniği uygulama kolaylığı, komplikasyon riski azlığı ve vertebra mobilitesini koruduğu için değerli bir tekniktir.

Anahtar Kelimeler: Asılı Adam kırığı, Lag Vida, Posterior

ABSTRACT

Aim: We aim to evaluate the posterior peduncle lag screw technique performed in our clinic for Hangman's fracture type 2 and 2A fractures in comparison with the literature.

Material and Method: Between 2017 and 2020, 7 patients with Hangman's fracture were operated with the posterior C2 pedİcle lag screw method. The average age of the patients, 6 men and 1 female, was 32.6 and none of our patients had any other pathology other than cervical fracture.

Results: There were no post-operative complications in 7 patients who were operated. In the 3rd month of the follow-up of all patients, ossification was observed in the fracture line. Screw malposition and malunion were not observed.

Conclusion: The posterior pedicle lag screw fixation technique is a valuable technique in patients with Hangman's fractures type 2 and 2A, as it is easy to apply, has less risk of complications, and preserves vertebral mobility.

Keywords: Hangman's Fracture, Lag Screw, Posterior

INTRODUCTION

Hangman's fracture is defined as a bilateral fracture of the C2 pars interarticularis without damage to the odontoid process and with or without spondylolisthesis of the C2 vertebral body upon the C3(1,2). The injury mechanism involves axial compression and hyperextension trauma. Treatment modalities vary for Hangman's fractures. While devices such as halo and cervical collar are used among conservative approaches, stabilization fusion methods with anterior and/or posterior cervical approaches are used in surgical techniques.

In our study, we aim to discuss 7 hangman's fracture patients who were type 2 and 2A according to the Levin-Edwards classification and operated with the transpedicular lag screw method in the light of the literature.

MATERIAL AND METHOD

Between 2017 and 2020, 7 patients were operated in our clinic for hangman's fracture type 2 and 2A. The mean age of the patients was 32.6 (range 19-42), including 6 males and 1 female. 5 of 7 patients applied to our hospital with complaints of a traffic accident and 2 complaints of falling from a height. All our patients had isolated Hangman's fracture, they did not have any other pathologies. Neurological examinations of our patients were within normal limits, only neck pain and restricted range of motion were present. Our patients were operated on with the posterior transpedicular lag screw method on the 2nd day after trauma.

SURGICAL TECHNIQUE

The patients were intubated by video laryngoscopy and carefully placed in a prone position. Under image control, the initial reduction was achieved by placing the head in a slightly flexed position and keeping the skull in traction, C1-C3 cervical median skin incision was made and paravertebral muscles were dissected laterally. The entry points were defined and cannulated instrument was carefully placed at the entry point under fluoroscopic control. K-wire was drilled through the fracture site into the corpus of the axis via the cannulated instrument. On the other side, the same procedure was followed. The length of the transpedicular lag screw is 24–32 mm, and the diameter of the head thread is 3,5 mm. The lag screws were introduced over the inserted wire and advanced to achieve uniform fracture compression and to avoid deviations of the fragments and screws. Intraoperative cervical flexion-extension maneuver was made and motion of spine without dislocation was seen on fluoroscopy.

RESULTS

Our patients did not have any hemodynamic problems during and after the surgery. Post-operative neurological examinations of our patients were within normal limits and they were mobilized with cervical arms on postoperative day 1. On the second postoperative day, cervical radiography and tomography were taken to check that there were no complications such as screw malposition and fracture line separation. All patients were followed up for 12 months and correct placement could be verified with CT scan and bony fusion was observed at the end of the post-op 3rd month.

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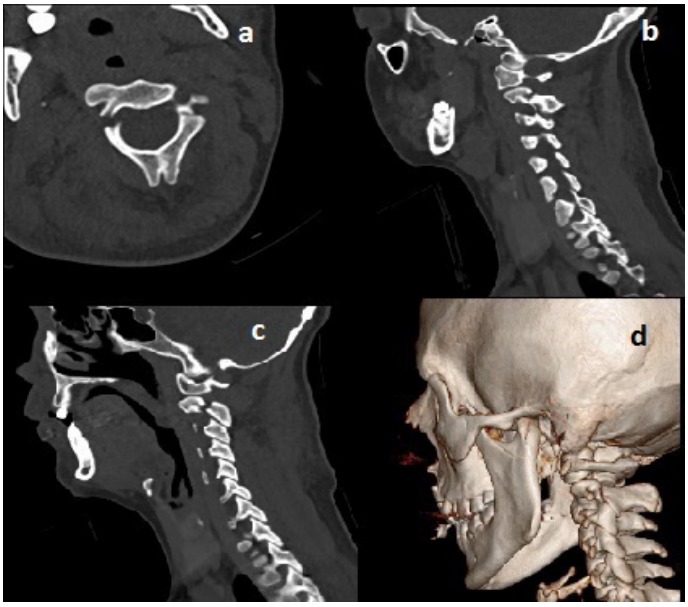

Fig 1: Shows fracture of C2 pedicles on axial (a), sagittal (b,c) and 3D CT images of the patient preoperatively .

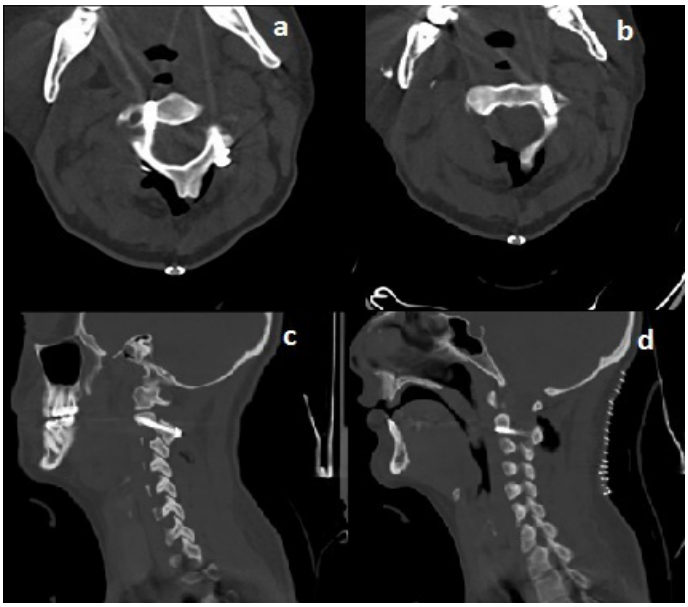

Fig 2: Shows lag screws extending from C2 pedicles to C2 corpus on axial (a,b) and sagittal.

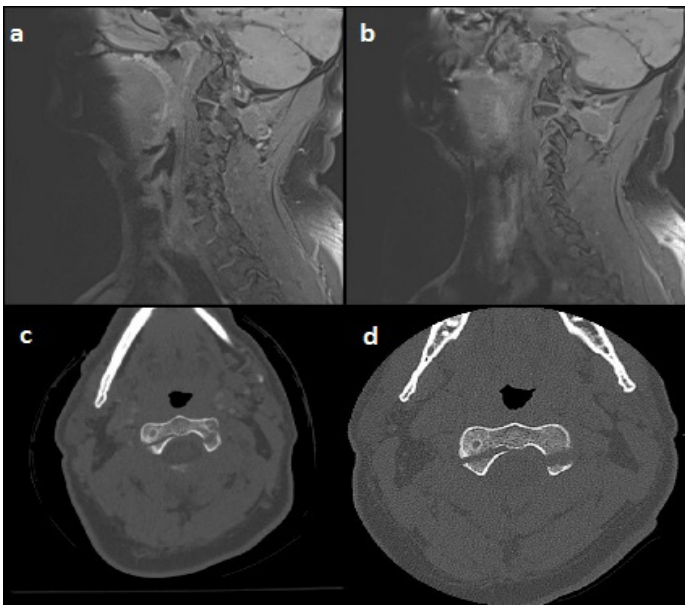

Fig 3: Shows bilateral C2 pedicle fracture on flair MRI (a,b), and on axial CT (c,d).

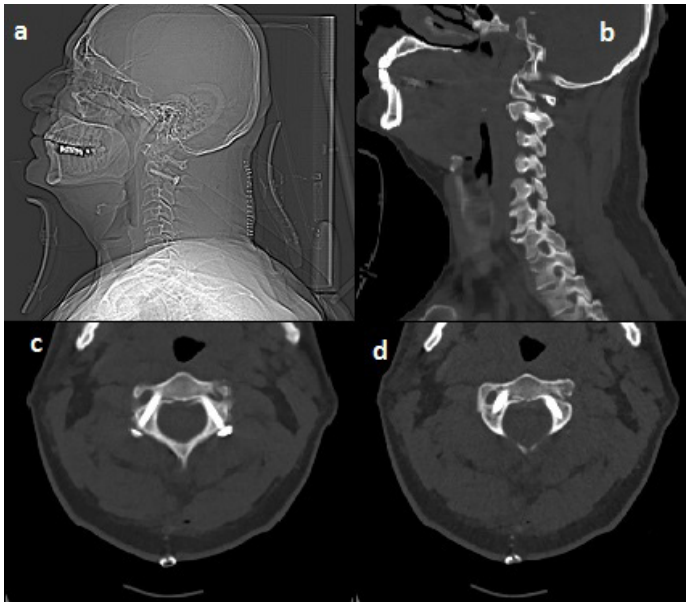

Fig 4: Shows bilateral lag pedicle screw fixation of C2 on lateral X-ray graphy (a), and cervical CT (b,c,d).

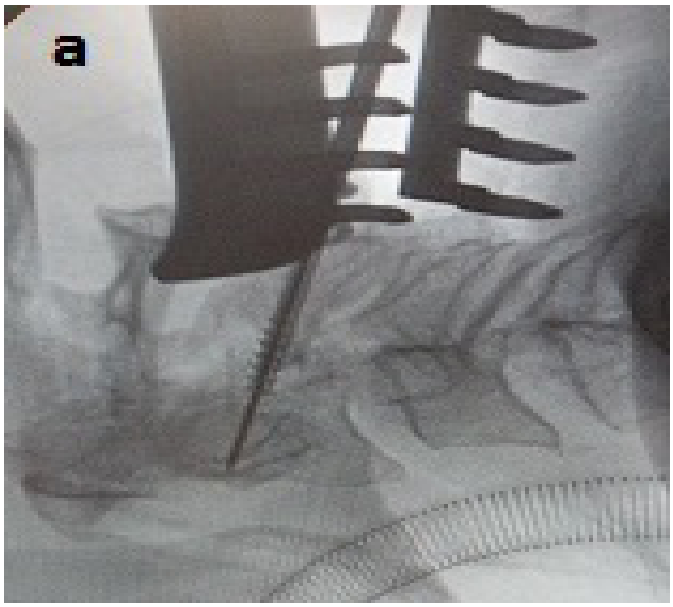

Fig 5: K-wire was drilled through the fracture site into the corpus of the axis.

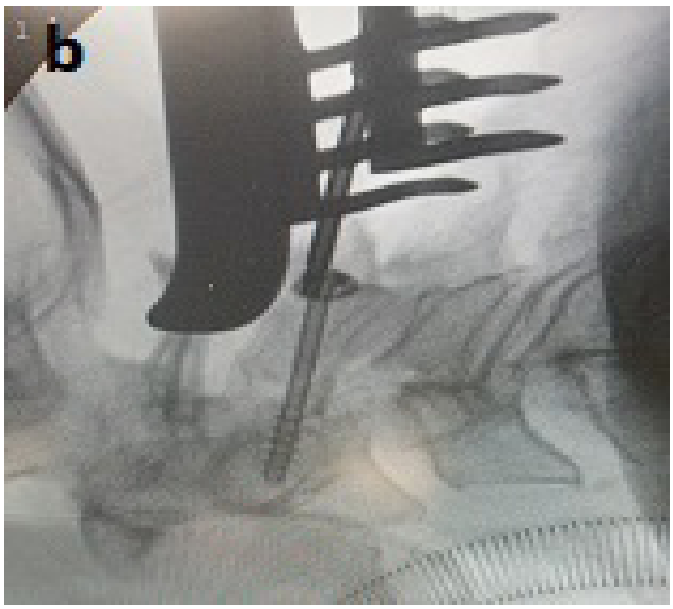

Fig 6: The lag screw passes the fracture line over the k-wire and is placed in the C2 corpus.

DISCUSSION

Halo, cervical arms and traction devices used as a conservative treatment method in hangman's type 1 fractures may cause complications such as pseudoarthrosis, anterior dislocation, and kyphosis (3,4). Planning surgery is recommended for Levine-Edwards hangman fracture types 2, 2A, and 3 (5).

The surgical decision depends on the type and extent of the discoligamentous injury between the axis and C3, and C2-C3 intervertebral disc damage. Angulation of more than 20 degrees on lateral radiography or cervical tomography is an important sign showing instability (6). The Conservative treatment approach in stable hangman fractures has a union rate of up to 93%, on the contrary, conservative treatment has seen about 50% nonunion in unstable fractures (3,7,8).

Surgical techniques include C1-2 and C2-3 stabilization from a posterior approach in addition to the anterolateral and trans-oral C2-3 discectomy and fusion from an anterior approach (9), and posterior pars and pedicle screw technique (10, 11). In anterior approaches, it is a technique with a high complication rate due to the risk of injury to vital and important structures such as the facial and hypoglossal nerve, external carotid artery and its branches, carotid sheath, and superior laryngeal nerve, and difficulty in exposure (12). Posterior approaches provide easier exposure and lower complication rates due to the absence of vital and important organs, however, normal mobility is lost in anterior cervical discectomy and fusion, and posterior C1-C2 and C2-C3 screw fixation methods. In the transpedicular lag screw technique, stability is provided by joining the broken lines and thus the movement of the axis is preserved (8,13). Borne et al. (14) reported that pedicle screw fixation in 13 patients with Hangman's fracture was a simple and safe method, and normal axis mobility was preserved. Similarly, the same results were observed in 15 Hangman's fractures by ElMiligui et al. (13) and reported that the pedicle screw method was safe. Hakalo and Wronski (11) treated 9 patients with hangman's fractures using anterior C2-C3 discectomy and fusion technique, and 8 patients with posterior pars screw technique. In their analysis, they stated that the pars screw technique is safer, easier, and less costly.

It is a technique that can be applied to the posterior pedicle screw technique, according to Levine and Edwards classification, type 2 and 2A and patients without osteoporosis. However, it is not recommended in cases where a screw cannot be inserted, such as axis peduncle malformation and axis infections.

In our clinical study, the clinical and radiological union was observed in hangman type 2 and 2A fractures with posterior pedicle screw technique. Also, hospitalization time and operation time were shortened, and most importantly, the mobility of the axis was preserved.

The lag screw osteosynthesis through the transpedicular represents a direct repair of the fracture and thereby restores physiological conditions without segmental fusion and preserves normal mobility. Advantages of pedicle lag screw osteosynthesis are minimal invasiveness, a shortened treatment time, high fusion rates, and motion segments were preserved. Serious complications with the posterior pedicle screw technique include vertebral artery injury or cord injury. Therefore, although it is a simple method, it should be applied carefully.

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