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Technical Note

A Simple Technique for Removing Broken Pedicle Screws

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ABSTRACT

Removing a broken pedicle screw is not always easy. Different methods and tools have been developed to remove the broken screw. Preserving the pedicle is an advantage for re-instrumentation. The head of the broken screw can be modified with the aid of a high-speed drill and the screw can be removed using a fractured screw removal tool without any problems. In addition, performing this procedure under the microscope reduces the risk of injury in the surrounding dura mater and the root. We believe that this simple technique can be conveniently used while removing a broken pedicle screw.

KEYWORDS: Spinal fusion, Broken pedicle screw, Pedicle

INTRODUCTION

The incidence rate of broken pedicle screws is 0.8%–24.6%, and it increases in major deformity corrections and multilevel fusion applications (2,3,8). Rostral screw is more prone to breakage than proximal screw (5). Removal of the broken pedicle screw should be technically easy and noninvasive. During this removal process, damage to the pedicle or weakening of its walls reduces re-instrumentation success. Many techniques have been described for the removal of broken pedicle screws (1,2,4).

TECHNIQUE

The spinal system is revealed by paravertebral dissection during surgery. After the caps of the pedicle screws are removed, both rods are removed. At this stage, the head of the broken pedicle screw is exposed. Intact screws are removed using an appropriate screwdriver. To remove the broken screw in the pedicle, the surgeon switches to the bio-microscope and the surface of the broken pedicle screw is exposed. Broken screw head is shaped in the form of a triangle using a 2 mm diamond tip drill (Figure 1A). With the help of an appropriate triangular screw-type extractor (Figure 1B), the screw is removed by turning the screw counterclockwise, while preserving the pedicle.

DISCUSSION

The removal of a broken pedicle screw may be difficult, but many methods have been described to remove embedded fractured pieces (1,2,4) (Figure 2). Miyamoto et al. reported a technique that involved creating a deep slice in the center of a broken screw and removing the screw piece by turning the screw counterclockwise using a screwdriver (7). McGuire has developed a tool that was inserted to the screw head and a pilot hole opened at the fractured surface to remove the broken screw (6). Sewell et al. developed a method to remove broken cannulated screws where the pedicle probe was placed on the screw cannula and then removed the screw by turning the probe like a screwdriver (9). Kaya et al. designed and developed a tool to remove broken screws by creating symmetric slits on both sides of the broken screw and removing the screw

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by rotating (4). In all of these methods, the force applied is biaxial, whereas in our method, the screw head is shaped into a triangle; hence, it is less likely to peel off owing to the fact that the applied power is divided into three axes. Our technique can be applied for bone fractures near the screw head without bone resection, but the requirement of bone resection in deep fractures is a disadvantage. Di Lorenzo et al. developed a tool that tightly holds a broken screw head. After locking this tool onto the screw head, they rotated counterclockwise to remove the broken screw by means of friction and gripping (1).

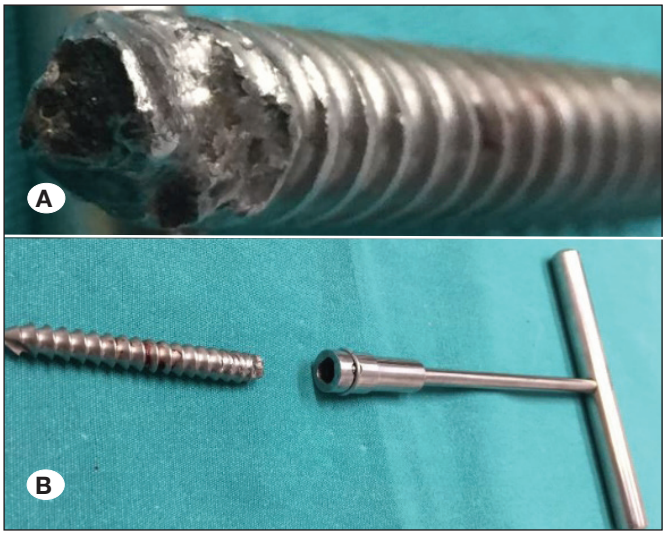

Figure 1: A) Shaping the broken screw head with the help of a high-speed drill. **B)** Compatibility of the removed broken screw with the extractor

However, in this technique, bone resection in the surrounding pedicle will be necessary to grip the screw head.

In our technique, the broken screw head is shaped with the help of a drill under the microscope by staying within the screw diameter; therefore, there is no need for bone resection from the surrounding pedicle. Preserving the pedicle is an advantage for re-instrumentation. In addition, performing this procedure under the microscope reduces the risk of injury in the surrounding dura mater and the nerve root. The extractor has three different sizes with 3.5, 4.5 and 6.5 mm bits. Owing to the fact that, 6.5 mm is the most commonly used screw diameter in the lumbar region, the broken screws were successfully removed in two cases with the help of a 4.5 mm extractor after being shaped by a high-speed drill. We believe that this simple technique can be conveniently used while removing a broken pedicle screw.

CONCLUSION

Removal of the broken pedicle screw should be technically easy and noninvasive. In our technique, the broken screw head is shaped using a drill under the microscope by staying within the screw diameter; therefore, there is no need for bone resection from the surrounding pedicle. During this removal process, damage to the pedicle or weakening of its walls reduces re-instrumentation success.

ACKNOWLEGMENT

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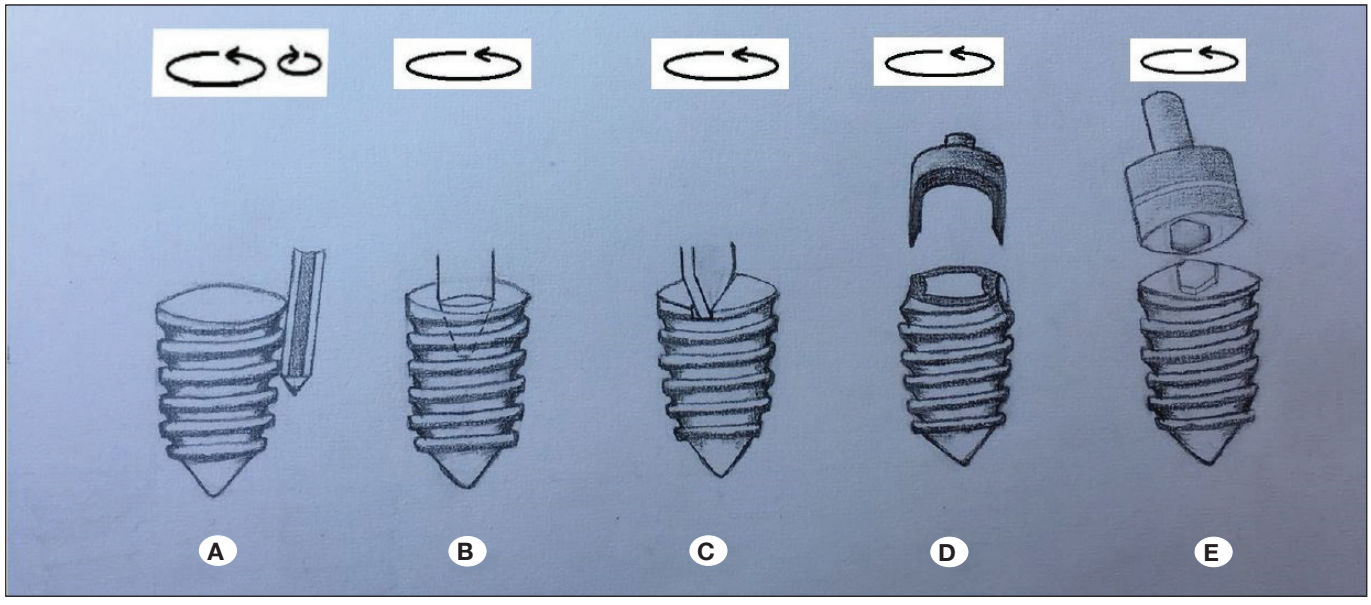

Figure 2: Methods of removing broken screws. **A)** Removing the screw after bone resection in the surrounding pedicle. **B)** Removing the screw by opening a hole in the middle and using an appropriate tool. **C)** Removing the screw by creating a slit on the screw head and using a screwdriver. **D)** Removing the screw by creating two symmetric grooves on the screw head and using a tool that is fitted on these grooves. **E)** Removing the screw after shaping the screw head into a triangle and using an extractor.

REFERENCES

1. Di Lorenzo N, Conti R, Romoli S: Retrieval of broken pedicle screws by “friction” technique. Technical note. J Neurosurg 92 Suppl 1:114–116, 2000
2. Duncan JD, MacDonald JD: Extraction of broken pedicle screws: Technical note. Neurosurgery 42:1399,1400,1998
3. Esses SI, Sachs BL, Dreyzin V: Complications associated with the technique of pedicle screw fixation: A selected survey of ABS members. Spine 18:2231–2239, 1993
4. Kaya AH, Dagcinar A, Celik F, Senel A: Simple technique for removing broken pedicular screw with plain and serviceable screwdriver. Eur Spine J 1116–1118, 2008
5. McAfee PC, Weiland DJ, Carlow JJ: Survivorship analysis of pedicle spinal instrumentation. Spine (Phila Pa 1976) 16 Suppl 8:S422-427, 1991
6. McGuire RA Jr: A method for removal of broken vertebral screws. Orthop Rev 21:775,776, 1992
7. Miyamoto K, Shimizu K, Kouda K, Hosoe H: Removal of broken pedicle screws. Technical note. J Neurosurg 95 Suppl 1:150,151,2001
8. Ohlin A, Karlsson M, Düppe H, Hasserius R, Redlund-Johnell I: Complications after transpedicular stabilization of the spine. A survivorship analysis of 163 cases. Spine (Phila Pa 1976) 19(24):2774-2779, 1994
9. Sewell MD, Woodacre T, Clarke A, Hutton M. Broken pedicle screw thread extraction from within the pedicle. Ann R Coll Surg Engl 98(4):285–286, 2016