Easy retrieval of polyaxial tulip-head pedicle screws by “U” rod technique

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Abstract The number of fusion surgeries increase each year which also increase the need for implant removal. In some cases, it can be extremely hard to remove a pedicle screw especially when there is a mismatch of the screw and the screwdriver. Also the screwdrivers can be contaminated during the operation, and this will cause a delay till the instruments are re-sterilized. There is a need for the removal of screws without special instruments. We describe a method for removing tulip-head polyaxial pedicle screws without special instruments. The screws are removed using an Allen key, a rod bender and a “U” shaped rod. We successfully removed 76 screws in 11 recent cases without any complications. The “U” rod technique is a simple and useful technique for the removal of tulip-head polyaxial screws.

Keywords Polyaxial pedicle screw · Tulip head · Removal · Allen key · U-rod technique

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Introduction

With the advances in spine surgery many implant systems have evolved most of which include tulip-head screws. However, there are quite a few patients undergoing implant removal each year either because of implant-related discomfort or implant failure (5–8%) [1–4].

Hardware removal can really be a difficult task, especially when there is a mismatch of screwdrivers as in the case of “no longer produced” implant sets. Also, the sterility of a screwdriver can be compromised during the operation and this will delay the removal of the screws till the instrument is re-sterilized. Monoaxial screws can easily be removed by the use of a plier or an appropriate sized Cobb elevator, but the removal of polyaxial screws can be extremely hard when the appropriate screwdriver is not available because the tulip-head component rotates independent of the screw shaft. This implies the need for a minimally traumatic and practical technique for the extraction of the screws. We propose a simple and fast procedure used in 11 recent cases for the removal of a total of 76 screws without complication. To our knowledge, this kind of a screw removal technique has not been reported elsewhere.

Materials and methods

Our technique requires the use of an Allen key (hex-head wrench) and a rod bender. After the removal of the rods and connectors by screwdrivers (Allen key is used to remove the nuts of the screws or connectors if the screwdrivers are inappropriate or contaminated) (Fig. 1), we bend the retrieved rod (or a piece of it- rod cutter is used for shortening if necessary) into a “U” shape (Fig. 2). One

Fig. 1 If appropriate screwdrivers are not found, an Allen wrench can be used to remove the set screws (*nuts*) during the initial phase of implant removal

Fig. 3 The U rod is inserted into the tulip of the pedicle screw and the set screw (*nut*) is tightened again with an Allen wrench

Fig. 2 The retrieved rod is bent to a “U shape”. Make sure that one end of the rod is as short as possible

arm of the U rod should be as short as possible in order to prevent any impingement to the surrounding structures during screw removal. The other end can either be left short if there is a rod holder or can be kept long if there is not. Then, the short arm of the rod is inserted into the tulip of the screw. The end cap is inserted (and tightened in the case of polyaxial screws to ensure locking of the screw-head articulation so they will move as a single unit) (Fig. 3). After locking, the “U” rod is turned counterclockwise to remove the pedicle screw (Fig. 4). This rotating maneuver can be done with or without the use of a rod holder. To protect the dura, if it is exposed, it should be covered in advance with a cotton sheet. It is important that, the part of the rod should be as short as possible to prevent any damage to the surrounding structures.

Fig. 4 The rod–screw complex is then rotated counterclockwise with the use of a plier or a rod holder to remove the screw. See that this technique can be used for tulip-head screws regardless of whether the locking mechanism uses a set screw or a clip. In cases where the dura is exposed, although the chances of a dural injury are low, a cotton pad can be used to cover the dura

Results

We have succeeded in removing a total of 76 pedicle screws in 11 cases by using this new and simple method. Three of those patients were pediatric patients who underwent revision scoliosis surgery and although the surgical field was smaller than adults, this technique could be applied without difficulty. There were no complications related to this procedure. Also, as this procedure did not require any implants, it did not increase the operative costs.

Discussion

Spinal transpedicular screw fixation is a widely accepted technique of spinal fixation in a variety of spinal disorders. As the number of procedures increase each year [5], so does the need for the removal of these implants. Some implant systems are used for a limited time and their use or import may discontinue after sometime; therefore, this brings up a problem. The extraction tools are unavailable for these implants when needed. Even if they are available, the sterility of these tools can be compromised during the operation. In this case, the classical approach will be to stop the operation (or just the screw removal phase of the operation) till the removal tools are re-sterilized. In the method we describe, no special instruments other than a rod bender and an Allen wrench are required. This technique is not difficult to apply for any kind of operator (even for the first year resident). Therefore, this simple method seems to be useful for spine surgeons performing revision surgery, especially in cases of implant mismatch or set contamination. The method described is especially applicable in cases where tulip-head screws are used regardless of whether they are locked with an end cap or a clip. Our simple and new method, which requires only a rod bender

and an Allen wrench is recommended for the removal of tulip-head pedicle screws.

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References

1. Duncan JD, MacDonald JD (1998) Extraction of broken pedicle screws: technical note. *Neurosurgery* 42:1399–1400
2. Lorenzo ND, Conti R, Romoli S (2000) Retrieval of broken pedicle screws by “friction technique”: technical note. *J Neurosurg (Spine 1)* 92:114–116
3. McGuire RA (1992) A method for removal of broken vertebral screws. *Orthop Rev* 21:775–776
4. Simmons JW, Andersson GB, Russell GS et al (1998) A prospective study of 342 patients using transpedicular fixation instrumentation for lumbosacral spine arthrodesis. *J Spinal Disord* 11:367–374
5. Weinstein JN, Lurie JD, Olson PR, Bronner KK, Fisher ES (2006) United States’ trends and regional variations in lumbar spine surgery: 1992–2003. *Spine* 31:2707–2714