Migration of Contoured Rod in Lumbar Spinal Canal: A Case Report and Review of the Literature

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ABSTRACT

Lumbar pedicle screw rod stabilization surgery is done increasing for degenerative spine disease. Implant hardware failure is reported variedly by different series, and many case reports of rare complications exist in literature. Migration of contoured rod into lumbar spinal canal is rarely reported. The clinical presentation of such a patient with radiculopathy and no focal neurological failure and subsequent nuances in the meticulous removal of the rod to avoid further injury to the cord or root is discussed.

Keywords: Lumbar pedicle screw, Contoured rod, Migration, Implant failure.

INTRODUCTION

Ever since its description, the lumbar pedicle screw rod spinal stabilization technique is not without complications. Though the learning curve and improvement in the construct and quality of implant systems have reduced implant failure rate from around 30% to even up to 3%,1-3 still implant failure in the form of screw breakage, screw loosening, rod migration, etc. are reported variedly and will continue to occur as long as the procedure is alive as some form of implant failure is inherent to any system described by whatsoever means its precision and meticulousness is being improvised. Here, we report a case of intracanalicular migration of a lumbar pedicle screw rod, which to the best of our search has not been reported in literature.

CASE REPORT

This is a 58-year-old female, who presented to us with a history of shooting type, electric shock type radicular pain along right leg since 6 months duration following forceful extension of her low back after flexed posture during her work in field. She had been operated elsewhere with L4, 5, S1 pedicle screw rod fixation 5 years back for her debilitating degenerative lumbar spine disease with intractable low backache after which she was symptomatically doing well. Despite advices regarding proper postoperative care of spine, she continued with vigorous agricultural activities in her field. On follow-up, it was noticed that there were loosening of screws on either side with migration of both rods cranio-caudally, the right-sided rod caudally and the left-sided cranially (Figs 1 and 2). Despite advice regarding implant removal, she
did not undergo any corrective measures and went on with migrated rods. Six months prior to her current presentation (Figs 3A and B), during her vigorous agricultural activity, developed a sudden electric shock like pain radiating from her right low back along right posterior thigh to calf and foot after extending forcibly from a flexed posture. There were multiple similar such episodes since then for which she sought medical advice. Her clinical examination was essentially normal except a positive leg raising test. Her radiological evaluation (Fig. 4) showed a cranial migration of left-sided rod which has penetrated through ipsilateral ligamentum flavum in the interlaminar space into spinal canal, crossing midline to reach up to the foramina of right-sided L2 level. After discussing with the operating surgeon of the previous surgery with regard of the instrumentation system, so as to enable its disassembly feasible, she was taken up for surgery, i.e. implant removal. Intraoperatively, after initial difficulties in finding appropriate sized drivers, the inni and cap screws were dismantled (Fig. 5). But because of dense fibrous tissue formed around the migrated rod, and its close proximity to thecal sac, limited laminectomy sufficient to dislodge the rod was done (Fig. 6). Due to the obliquity of the rod which was hindered by the screw pillars, the screw was needed to be drilled to retrieve the rod. After adequate exposure, the intracanalaricularly migrated rod was meticulously removed without any injury to thecal sac or root (Figs 7 and 8). Similarly, the other rod was also removed. Adequate posterior bony fusion between the spinal elements were noticed. Postoperatively, she did well and is ambulant pain free.

DISCUSSION
The principle of internal stabilization of spine was evolved to improve the rate and rapidity of bony fusion and provide early stabilization. The history of posterior internal spinal stabilization surgery started with Harrington instrumentation which is with its own known demerits and which was subsequently replaced by the concept of segmental fixation. The concept of pedicle screw fixation has its early reports in 1940s though the wide spread recognition and acceptance came late in 1980s. The pedicle is the strongest part of a vertebra, and hence the force nucleus of spine. The pedicles are used to create strong construct in spinal stabilization surgery. Biomechanical studies have shown that implant constructs using screws placed through the pedicles provide a more rigid fixation than any other forms of internal fixation. Though with much benefits, still the pedicle screw rod technique is not without complications, and implant failure is inherent to any systems invented. Screw breakage due to bending fatigue is the primary cause of implant failure. However, rod migration is reported in literature less often.
Konuralp I (2014) reported a case of migration of lumbar rod to posterior sacral region.\textsuperscript{5} Ali MA (2001) reported on a case of acute gastrointestinal tract bleed.\textsuperscript{6} Kenichi H (2007) reported on a migration of Luque rod into pelvic cavity and rectal injury.\textsuperscript{7} Sarvdeep D (2010) reported on the migration of rod to knee.\textsuperscript{8} Ohlin A (1994) in their series of 34 patients reported a screw bolt disconnection in three patients.\textsuperscript{9} Jutte PC (2002) in their study reported a rod migration rate of 2.8\%.\textsuperscript{10} Faraj AA (1997) reported in their series of 648 cases with rod screw disconnection in one case.\textsuperscript{11} Aggarwal A (2014) reported a case of rod migration in a case of lumbar spondylolisthesis and, intraoperatively, it was attributed to improper coupling between inner nut and screw head.\textsuperscript{12}

Rod migration does happen when the screw cap or inni is incompletely tightened over the screw head. Present day instrumentation systems are predominantly designed to avoid such complications by the principle of screw head locking system where a terminal tightening tick sound is mandatory to be heard by the surgeon to ensure complete and adequate tightening.

Another major reason for rod migration is improper coupling between the screw cap and the head which gives the perception of complete screw tightening but are not properly coupled. It happens when the screw is tightened
before appropriate approximation of the grooves of the screw and the cap.

Eldin and Ali (2014) in their review of 100 patients with hardware failure reported a failure rate of 36% in single level fusion and 64% in multilevel fusion.13 The rod loosening rate was 22%.

In the present case report, the failure of the screw to hold on the rod might be more likely due to inadequate tightening of screws intraoperatively, there was no coupling failure noted. The follow-up radiology showed a cranially migrated left-sided rod lying extracanicularly. The contouring of the rod has made the rod to lie with its concavity facing inferomedially. Available X-ray lateral view showed the rod migrated up marginally. The X-rays taken subsequent to the aggressive manual agricultural labor with flexion of lumbar spine and subsequent rapid extension showed the migration of the rod intracanicular through the interlaminar space of L2-L3 finally, the tip of the rod placed at pedicle of right L2. This migration was probably due to the natural twist that must have occurred at the time of aggressive labor work and due to the fact that the rod was a contoured one. Fortunately, the dura was not injured and there were no neurological deficits but for the radicular pain that correlated with the anatomy.

The removal of such contoured intracanicularly migrated rod needs proper preoperative planning and intraoperative execution. Pulling of the rod without loosening screws or adequate laminectomy may cause injury to the cord. Removal of screws using appropriate spanner may make the procedure tricky, when the previous implant system was not known. Meticulous laminectomy and release of soft tissues around the rod is adequate enough to remove it with out injury to the nearby nervous tissue. In the present case report, we have followed the appropriate neurosurgical principles and we could achieve a removal with no added postoperative deficits and relief of the preoperative pain.

Such cases are likely to be encountered in future, given the rise in use of spinal stabilization procedure, the awareness of this case report may help to guide the surgeon to be prepared for the surgery with special mention on the need for following standard neurosurgical principles and on the need for knowledge of the older implant systems and, more importantly, a calm attitude and common sense during the procedure which may enable the surgeon to act appropriately. This case also opens the important issue of documenting the details of the implants used and the availability of the systems from the manufacturers.

CONCLUSION

Intracanicular migration of rods is rare in lumbar pedicle screw stabilization surgery; however, a loose contoured rod can migrate easily during forceful activity. Meticulous surgical techniques are needed to remove the rod without complications.

REFERENCES