Intraspinal Intradural Sublaminar Wire-consequences:
Revision Surgery with Note on Correct Technique

Shailesh Hadgaonkar, Kunal C Shah, Ashok Shyam, Parag Sancheti

ABSTRACT
Sublaminar wires are used as a modality for posterior spinal stabilization is described for selective indications. However, its use has been declined mainly because of high chances of neurological complication, ambiguity on long-term effect of wires on the spinal cord and recent advances in posterior instrumentation of spine. Improper wiring techniques are the most common cause of dural complications. We report a case of 60 years old gentleman presented with symptoms of lumbar canal stenosis to our spine department with a loop of wire at stenotic level. He had spine surgery done 20 years back using sublaminar wires. Intraoperatively, we found that the wire was looping through the dura. We performed revision decompression with posterior stabilization using pedicle screw/rod construct and removed the wire. Thus, our case highlights the consequences of subdural location of stainless steel wire, revision technique and highlights correct technique of insertion of sublaminar wires.

Keywords: Revision surgery, Subdural location, Sublaminar wire.

INTRODUCTION
Sublaminar wires as a modality for posterior spinal instrumentation with L shaped rods was popularized by Luque.1 John dove introduced use of Hartshill rectangle with sublaminar wires for internal fixation of spine to obviate disadvantages of luque rods.2 Since then sublaminar wires with Hartshill rectangle is used for posterior instrumentation in variety of conditions like spinal fractures, tuberculosis, deformity corrections,3 etc.

With the advent of modern spinal instrumentation and improved surgical techniques, sublaminar wires are now less commonly used.3 Major concerns regarding them are neurological complications like dural tears,4 fear of long-term untoward effect on spinal cord,5,6 inadequate corrective forces,7 etc.

We report a rare case of presence of wire in subdural location for 20 years with no neurological deficit, documenting it of having no stenosing effect on cord and a note on correct technique of insertion of sublaminar wire.

CASE REPORT
A 60-year-old retired electrician came with the chief complaint of low back pain radiating to left lower limb and associated with tingling numbness since 4 years. He also complained of heaviness in lower limb with neurogenic claudication of 20 meter. There was no associated weakness in lower limb. Bladder and bowel function were normal. There was no history of medical illness. On examination, there was tenderness over lower lumbar region, and neurology was intact.

Patient gave past history of spine surgery done 20 years back for spinal fracture sustained due to fall from height spine stabilization was done using sublaminar wires. One year after the surgery, patient developed implant bursitis for which implants were removed. Patient was asymptomatic since then until 4 years back when he started experiencing the present symptoms.

We performed a radiograph of lumbar spine which revealed old compression collapse of L3 vertebra with anterior wedging of L2 and L4. Disk space was reduced between L2 and L3. Wiring was noted at L4 lamina (Figs 1A and B).

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Magnetic resonance imaging (MRI) was revealed old compression fracture L3 vertebra with lumbar canal stenosis at L4 to 5 level. Minimal artefacts due to previous implants (wire) were seen (Figs 2A to C).

With these investigations, the diagnosis of lumbar canal stenosis with previous implant in situ was confirmed. Routine laboratory investigations were normal and due to history of trauma, the fracture was considered to be of traumatic origin. The patient was offered treatment in the form of revision decompression surgery with removal of implant and instrumented fusion.
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SURGICAL PLAN

Since, it was a revision surgery adequate counseling and appropriate consent was taken for decompression and posterior stabilization with wire removal.

SURGERY

Standard midline approach taken and spine was exposed. There was a lot of adhesions and fibrosis because of the previous surgery which was carefully dissected. Pedicle screws was inserted. Wire looping through L4 lamina found (Fig. 3A). Rods applied to pedicle screws and interlaminar space distracted. Spinous processes cut and decompression started. Surprisingly, we found the piece of sublaminar wire looping through the dura (Figs 3B and C). We dissected the wire carefully and cut the wire on one end close to dura and gently pulled the other end of the loop. Minimal cerebrospinal fluid (CSF) leaked after the pull-out of wire from the site where it was piercing the dura. This confirmed the intradural location of wire. Cerebrospinal fluid leak was stopped with surgical-gelfoam pressure. Wide decompression done from L2 to L5. Cord appeared normal. Kinking of cord due to presence of wire was relieved after wire removal (Fig. 3D). Allografts used to augment fusion from L2 to L5. Cerebrospinal fluid leak checked before surgical closure of wound. Figures 4A and B show postoperative radiographs.

Postoperatively, patient was relieved of symptoms and neurology was intact. Follow radiographs show good fusion at arthrodesis site (Figs 5A and B).

At 3 years follow-up, patient is significantly better clinically.

DISCUSSION

Although, spinal instrumentation has immensely developed in last decade, leading to less implant related complications, ease of insertion and less neurological complications; sublaminar wires are still used because of its cost-effectiveness.7 Neurological complications associated with sublaminar wires are mainly attributed to improper technique.8 It is important to gauge the depth of spinal canal while insertion of wire to prevent cord damage because of inability to visualize the passage of wire tip.9 Common technique errors are improper configuration of wire and its tip or inability to maintain contact between the wire tip and inferior surface of lamina.9 In our case, the wire was subdural in location which may be due to improper insertion technique.

We highlight following simple steps for making configuration of wire and its tip with basics step of insertion. The tip of the loop should be made of appropriate length and thickness so that it prevents the dural injuries and is easy to pull. The bends of the wire primary curve, secondary curve and the gooseneck should be carefully made to avoid deep penetration in spinal canal. The basic
steps of insertion include introduction of wire followed by advancement, roll through and pull through should be meticulously followed to prevent dural damage.\textsuperscript{10}

Lea-Plaza et al\textsuperscript{6} showed that long-term presence of stainless steel wire causes a formation of fibrous tissue separating cord from wire. Bhojraj et al\textsuperscript{7} suggested that this fibrosis does not cause stenosis. In our case also we found some fibrosis, around the wire not causing pressure effects or stenosis. Our patient was asymptomatic for long-time until he presented with symptoms, showing that presence of wire did not have long-term effects on dura.

Thus, our case denotes that long-term presence of wire in spinal canal did not have harmful effect on dura. Proper technique of insertion is the key to prevent dural penetration.
REFERENCES


