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# FAILURES IN NECK AND LOW-BACK SURGERY: CAUSES AND OUTCOMES

Kadir Kotil MD

## Introduction

There are no sufficient or convincing data in the literature about the algorithm to be followed against the failed original procedure in the spinal surgery. The issue is not homogeneous. The most frequent cause is erroneous selection of patients. The main principle in neck and low back surgery after correct patient selection must be to decompress the symptomatic area by avoiding the use of an insufficient technique that might require other operations following the original operation. The basic principle must be to leave the spine stable after complete neural decompression. Failure after the spinal surgery occurs mostly in the lumbar and cervical regions.<sup>21</sup> Use of implants out of indication especially recently and erroneous design, using the radiologic studies including MRI (magnetic resonance imaging) and neglecting the classical examination methods, and omitting surgical principles can be listed among the main causes of failures. We know that the risk of failure is extremely low after decompression surgery in patients with significant neurologic compression is present if the clinical picture of the patient is suitable. However, we see failure in a small portion of the patients despite the correct decompression both in the cervical and lumbar regions. Failure in restoring the comfort of living of the patient after the decompression procedures applied, continuous need of analgesics, or any other failures causing re-operations bring these patients back to us with failed spinal surgery or “failed neck and back syndrome”. Although failure varies greatly

when compared to the total number of cases, there are series with failure rates between 5-54% for the cervical region and with 7-70% for the lumbar region.<sup>6</sup> However, only 10% of these become symptomatic, thankfully.<sup>21</sup> The rates of the third operation for these patients can be given as 12%. This problem brings the psychosomatic complaints forth. It is very difficult to help a patient with an impaired quality of life. It is also seen as a problem with significant socio-economic dimension. Differential diagnosis of the pain can become difficult with this reason.

### Factors Causing Failure Include the Following:

#### A- Insufficiency of diagnosis

- 1- Errors in the patient selection
- 2- Insufficient tests (occult brucellosis)
- 3- Sufficient tests with missed lack of clinical consistency (metastasis)
- 4- Tandem stenosis
- 5- Missed lesion (missed far-lateral disc)
- 6- Missed instability

#### B- Incomplete decompression

- 1- Residual disc or presence of pathologic tissues
- 2- Recurrence in the same level within the first 6 months
- 3- Appearing pathology in the adjacent level
- 4- Symptomatic massive granulation tissue
- 5- Failure in removal of the foraminal stenosis

#### C- Lack of healing (Pseudoarthrosis)

- 1- Patient-related factors
- 2- Surgery-related factors

**D-Intra-operative errors**

- 1- Wrong level
- 2- Wrong side
- 3- Neural damage related to over-manipulation
- 4- Creation of instability
- 5- Incompetence of the surgeon

**E-Epidural fibrosis**

- 1- Symptomatic
- 2- Asymptomatic

**F-Arakhnoiditis**

- 1- Primary
- 2- Secondary (iatrogenic)

**G-Infections**

- 1- Superficial skin infections
- 2- Spondylodiscitis
- 3- Empyema
- 4- Cottonoma (foreign body)

**H- Postoperative muscular insufficiency****I- Postoperative reflex sympathetic dystrophy****İ- Postoperative epidural hemorrhage****J- Complications related to position (brachial plexus, ulnar nerve)****K- Neuropathic pain****L- Missed psych-somatization**

In this section, the incomplete decompression and lack of healing, which are the most frequent causes of the “failed neck and back surgery syndrome” (FNBS) will be reviewed, and factors that are seen less will be mentioned briefly.

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## Wrong Diagnosis

Indications applied with a wide coverage with economic reasons are among the causes of FNBS. The advice “you can be paralyzed if you do not undergo operation” directs the patient to surgery; rate of cases operated this way because of low back and neck pain can be as high as 34%.<sup>6</sup> Another factor is the advice that there is no way other than surgery given to the patient without neural compression or instability

that had tried all kinds of treatment modalities. The most frequent reason for the wrong diagnosis is the decision made without performing a neurological examination. For example, performing the cervical disc surgery in patients with trap neuropathy or fibromyalgia is the most frequent error<sup>2</sup>.

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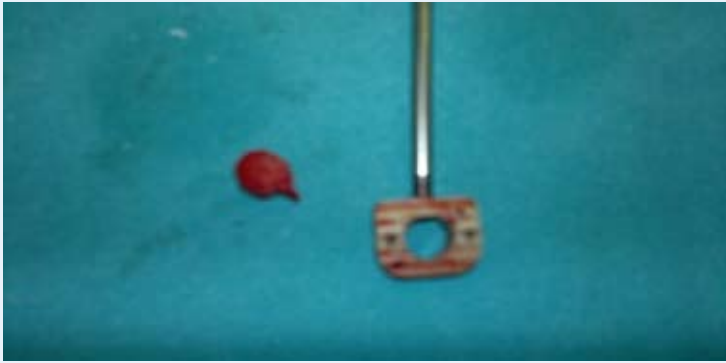
## Lack of Healing (Pseudoarthrosis)

The lack of healing after the osteosynthesis performed in the lumbar or cervical regions vary between 10 and 80%, whatever the known or performed surgical technique is; but thankfully, very few of them present themselves as low back or neck pain or become symptomatic.<sup>19,22</sup> In case the symptomatic cases have neurologic deficits with progression, the watch-and-see algorithm must be abandoned and revision stage must be shifted to. For example, the condition causing the lack of healing resulting in axial neck or radicular pain after anterior cervical discectomy must be determined in the revision. In addition, an algorithm must be prepared to avoid recurrence after revision. If needed, anterior decompression can be reinforced with autograft with added posterior osteosynthesis. (Figure 1) The success of fusion in these cases reaches 90%.<sup>3</sup> It must be questioned if the additional measures (if taken) will be sufficient. If the endplates are not sufficiently curetted similarly in the cervical region, the graft placed in the mesh will be formed, but it will not be strong enough to bind to the body. (Figure 2)

For example, in the ALIF (anterior lumbar interbody fusion) technique, the rate of pseudoarthrosis is



**Figure 1:** (A) In the patient with unrelieved neck pain after the anterior cervical discectomy, lack of healing was considered, and (B) fusion was performed with anteroposterior autograft (C). The neck VAS score of the patient has been improved from 7 to 3.



**Figure 2:** See the allograft placed in mesh has been formed in the mesh, but has not been bonded to the endplates.

38% event when structural tibia graft and bone morphogenic protein are used together %38 dir.<sup>8</sup> More than half of the grafts placed within the mesh in the interbody fusion are resorbed. Therefore, graft must be placed in front of and behind the mesh. (Figure 3a) Autograft application is the best technique for both ALIF and TLIF (transforaminal interbody fusion) and protects the patients against repeated revision procedures. In risky patients that fusion will develop late, performing posterior fusion in the same session against any anterior pseudoarthrosis is a protective approach against failure.<sup>21</sup> (Figure 3b)



**Figure 3a:** The lack of interbody fusion is differentiated as the cause of the intractable low back pain in the preoperative period.

There are articles reporting that adjacent segment disease is seen in more levels after very strong fusion particularly in the upper segment.<sup>22</sup> Meshes that can contain large volumes of graft must be used for the fusion. Implants occupying the bone graft cause incomplete healing. Surgeons that place only grafts between the bodies to eliminate this problem have reported fusion rate as 95%.<sup>9</sup> It is recommended that the surgeon should perform the technique s/he is familiar most with the least damage.

For example, although PLIF (posterior lumbar interbody fusion) is a known technique, it is known that neural injuries with this technique are more frequent as compared to the TLIF technique.<sup>8</sup>



**Figure 3b:** The failed anterior fusion after the spondylolisthesis surgery with ALIF technique can be recognized. Posterior fusion makes the system stronger, and the patient continues his/her life without problems.

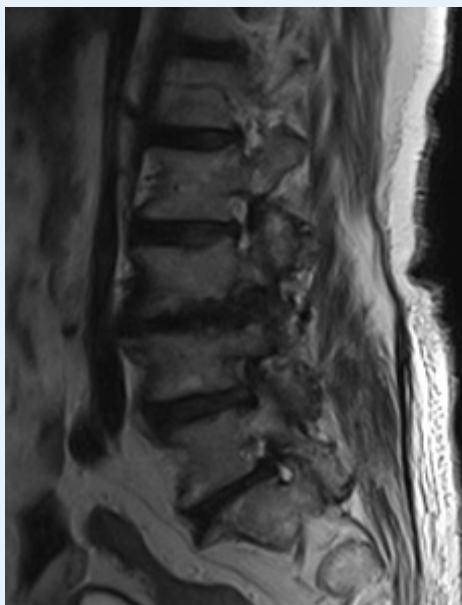
It is obvious that instrumentation on the area that fusion will not be applied will cause loosening and insufficiency.<sup>5</sup>

Medical treatment with injections including transforaminal steroid, local anesthetics, or hyaluronidase must be applied in patients without neurologic deficits who are in the plateau period<sup>7</sup>. Care must be given to the use of autografts in risky patients and factors that will prevent fusion like smoking must be prevented.

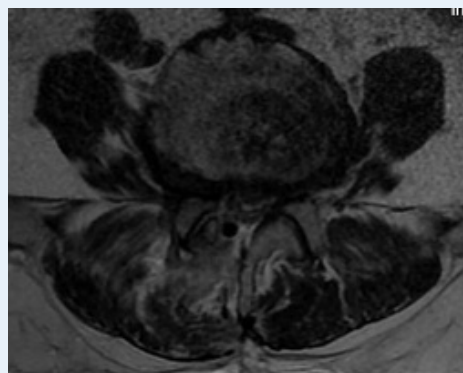
### Incomplete Decompression

Incomplete decompression is most frequently seen in the foraminal level<sup>4</sup>. For example, laminectomy in a very narrow channel can give the impression that decompression is complete. However, intraforaminal portion of the nerve can be missed. (Figure 4, 5)

Exposure or decompression of the proximal of the nerve root will not relieve the extra-foraminal compression. Extra-foraminal decompression must be applied if needed where compressions extend outside the foramen. (Figure 4) The layout in the OR



**Figure 4:** The curative surgery in the patient that was operated three times because of incomplete decompression was possible with extraforaminal approach.



**Figure 5:** It is seen that the cause of incomplete decompression despite 3 operations lies in the foraminal level.

is also very important. The surgeon must face the negatoscope particularly for the multiple pathologies and must frequently view the x-rays placed on the negatoscope with small spaces in-between.<sup>4</sup>

Nine percent of the patients come back because of re-herniation after lumbar disc surgery.<sup>14</sup> In this context, timing of the pain is very important. While the cause of pain in the early period is wrong distance or residual disc, pain in later periods will be related to hematoma, fibrosis or instability.

### Adjacent Segment Degeneration and Disease

Is disease related to adjacent segment degeneration or is it related to natural ageing? Or, is it a strained joint disease? Is it an over-loading that developed after surgery? Full consensus appears to be difficult. Adjacent segment degeneration in the cervical and lumbar spine has been radiologically documented. Katsuura and colleagues<sup>15</sup> found significant degenerative changes in 21 patients out of 42 (50%) in radiologic examination, some of which were found in the adjacent levels, within a follow-up period of 9.8 years after anterior cervical fusion. Independent researchers examined patients clinically and radiologically. Deterioration was found in 92% of the cases in the adjacent levels. However, there was no correlation between the radiographic adjacent segment degeneration and clinical symptoms.

Varying figures are reported for the incidence. However, incidence is in the range of 24-50% for

the cervical region, and 5.2-70 for the lumbar region, fortunately only one-fourth being symptomatic<sup>11</sup>. It is known that the frequency of hypermobility in the upper segment and narrowing is higher in the 5-year follow-up as compared to the lower segment. The rate of this problem being symptomatic is 5-12%.<sup>11</sup> Adjacent segment degeneration is a radiologic finding, and the point it will lead is suspicious. However, development of findings including scoliosis, sliding, narrow channel, Are-herniation and stress fractures can be possible years after the original operation. (Figure 6) The incidence of narrowing of the channel within 5 years is higher after strong fusion. However, it must be known that normal ageing, that is, the natural process can also contribute.

Although the debate on whether or not the adjacent segment disease is related with long segment fusion, it is generally accepted that there is no relation.<sup>18</sup> It must be considered that especially kyphosis can develop after original operation performed without considering the sagittal balance.<sup>1</sup> To mention the recommendations on this issue:

- Absolute revision: where there is neurologic deficit consistent with the radiology
- Relative revision: This is recommended when there is pain, deformity in the adjacent vertebra, instability or lysis and narrowing of the channel.<sup>23</sup>

It has been reported that approach must be more conservative in the lower adjacent segment disease, or the patient must be followed-up for a longer period.<sup>23</sup> Radical treatment must be performed after applying all kinds of pain treatment.



**Figure 6:** The pars fracture is the cause of low back pain following the strong fixation at year 5.

## Arachnoiditis

It is known that arachnoiditis develops following multiple operations. Apart from this, it can develop after the intradural operations, use of contrast agent, after infections or pseudomeningocele. Causes of some of these are unknown.<sup>31</sup>

Asymptomatic arachnoiditis can be present in the radiology. It has 3 types:

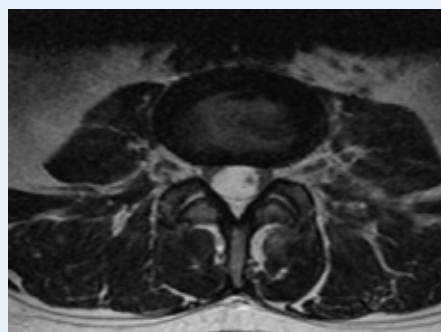
- 1- Those adhering to the medial dural wall of the nerve roots, which is the most frequent type (Figure 7)
- 2- Those adhering around the spinal cord
- 3- The inflammatory type called candle – tripping. Since the nerve roots are edematous in this type, they appear as if adhered to each other, and give the pseudo tumor appearance radiologically.

Patients have symptoms including, intermittent pain and cramps, paint in legs or hip.

Such cases are mostly diagnosed after the further imaging studies and electrophysiological studies performed upon failure upon continuance of the pain in the postoperative period.

Although treatment varies with the type,<sup>10</sup>

- a- Steroids
- b- Anti-epileptics
- c- Intrathecal hyaluronidase
- d- Surgical dissection of adhesions



**Figure 7:** Being familiar with arachnoiditis cases will prevent failed spinal surgery. See the bunching of the cauda equina fibers in the periphery.

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## Scar Tissue

The scar tissue seen in the studies made because of postoperative pain is mostly asymptomatic. Rate of the symptomatic cases is 10%.<sup>2,3,7</sup> Although they give the impression of nerve root or dural sac compression, these can only be accused in the presence of a related neurologic deficit, and operation or decompression can be required as such. Cautery must not be used, and risk can be minimized through a tight hemostasis.

Spinal chord stimulator must be applied in cases that pain cannot be relieved, and further surgical techniques must be applied as the last resort.<sup>17</sup>

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## Wrong Distance

Apart from the wrong patient, factors including wrong distance or wrong side are also among the factors that increase the number of operations. In the wrong distance, which is one of the causes of failure, the recent data continue to be disappointing, and incidence is as high as 15%. It is known that 99% of the lawsuits opened in the USA are related to wrong patient, wrong level and wrong procedure.<sup>13</sup> To prevent, the method “ask the fluoroscopy image to everyone in the OR, ask yourself, suspect and ask again, if not sure, call the radiologist and ask him/her” must be used. The congenital anatomy present in all the studies, advanced osteoporosis or obesity can prevent the peri-operative correct diagnosis of the distance during the fluoroscopy. With this reason, we must ask the question, “am I in the correct location” time and time again; even when we are most experienced and must be sure about the correctness of the distance and the side. The recommendation for this insufficiency is to suspect always in relation with surgery.

In case there is no progressive neurologic deficit before the revision surgery, all kinds of medical treatments must be tried. Spinal chord stimulator must be considered at the last stage. There are articles reporting that this application gives good results.<sup>5</sup>

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## Infections

Infections are seen more frequently in the lumbar region, and rarely in the cervical region. Removal of the disc, which is an avascular structure, can eliminate the infection risk for the cervical region. Complete

removal of the disc in risky patients like diabetics can prevent spondylodiscitis. The address of the severe pain developing in the lumbar region particularly between days 5 and 20 will be spondylodiscitis, while foreign materials must be considered for pain that develops months later.<sup>9,10</sup>

## Questions

- What type of surgery should I perform in the revision?
- From whom should I get help?
- Why did the inefficiency/failure happen?
- Will pain be relieved with revision?
- Should I take additional measures? (blood, Rbmp, TUR, etc.)
- A/P or combined surgery?
- Is the spinal chord stimulator a more correct choice?

## What are the Difficulties of the Revision?

- 1- Scar tissue barrier
- 2- Uncertainty of anatomy
- 3- Increase of bleeding
- 4- Reducing of the tissue strength and healing problems
- 5- Frequency of radiculitis or arachnoiditis
- 6- Complications related to the extended surgery

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## Last Words

- Has the patient selection been performed correctly?
- Correct side and correct level?
- Is the decompression full? Are the nerve roots decompressed?
- Is there adjacent system disease? (add dynamic system?)
- Was a fusion-oriented surgery performed?
- Have the posterior tension band and facets been preserved?
- Is pseudoarthrosis is symptomatic or asymptomatic?

The treatment of failed spinal surgery is to avoid it. It must be known that the highest success can be achieved with original operation, and success is gradually reduced with re-operations. FNBS is a syndrome that exhausts the patient, surgeon and society so that pull of is almost impossible with the severity increased in relation with socio-economical and psychosomatic problems, which two important results of FNBS syndrome.

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