

# Surgeon Handedness in Transpedicular Instrumentation - A Short Review

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## Abstract

Many surgeons have right hand dominance as in the normal population. Right hand dominance may cause difficulties depending on the position of the patient and the surgeon position according to the patient during surgical treatment. Even when the patient is operated on in the neutral position, there are some challenges. In spinal surgery, the difficulties faced by surgeons are in the phase of spinal instrumentation, which requires bilateral application. The challenges experienced by surgeons with left hand dominance are quite different.

**Keywords:** Instrumentation; Spine; Surgeon handedness

## Introduction

Right hand dominance is very high in society. The difference between right or left-hand usage also affects people's ability. The usage of right or left hand also determines human posture. It is seen that postures are different during any application in people who use different hands. During surgery, it is known that surgeons feel different difficulties according to the position of the patient among the surgeons with right and left-hand use. Besides there are some difficulties and variabilities that are linked to being on the right or left of the patient. We will try to present a short review from the literature on the ground of spinal instrumentation.

## Handedness of Surgeons and Position Differences of the Patient in Spine Surgery

Today, the number of patients undergoing spinal surgery is not to be underestimated. Right-handed surgeons are more comfortable with the left-sided pathologies of the patient because spinal surgery usually involves patients in the prone position. Right-handed surgeons move faster and more controlled in the left-side pathologies of patients because of the thinning of the laminae towards the caudally and the beginning of the decompression phase from here. The same is true for the right-side spinal pathologies for surgeons using the left hand. There are a lot of publications about the increasing spinal instrumentation nowadays. The complication rate increases with the increase in the use of transpedicular screws [1,2]. In some series, complication rates are up to ranging from 15.9% to 54.7% [3-5]. Many of these high complication rates are due to screw malposition's [6]. Besides complications, revision rates are quite high also. It is also noted that the screws should be revised with the rate of nearly 50% in the long term follow up [2].

There are various methods at the moment for pedicle screw insertion, which include the free-hand technique, C-arm guided and computer-guided screw insertion. In order to avoid the complications, it is absolutely necessary to benefit from technology [7,8]. However, the free-hand method is still frequently used which described by Kim and Lenke. And also, free-hand technique decreases exposure to

radiation and surgery time. And in the publication, they found a cortical perforation rate of 6.9%. This rate is accordance with the other techniques [9].

Although the use of fluoroscopy may show malposition of pedicle screws, anatomical landmarks and experience have vital importance at this point. As a matter of fact, in the study Kotil et al. carried out, they showed that the surgical period was less, the infection rate was lower, and the screw malposition was in the acceptable ratio in the instrumented patients without using fluoroscopy [10].

One of the most important criteria whether fluoroscopy use or not that the patient should be in neutral position and the surgeon should be orientated to the patient's position, especially in free-hand application. In spinal surgery, it is necessary to know the differences that will be caused by using right or left hand. Only one publication has been reported today that on the left side, screws are inserted through cranially and on the right side, inserted through caudally by right handed surgeons. Yaman et al. have measured the application angles and compared right and left sided screws on radiological basis. The difference in orientation has been founded statistically significant [11].

While performing the instrumentation on the left side of patient, the right-handed surgeon applies screws more cranially due to the oblique position through the patient. Right-handed surgeons are also more likely to apply screws more caudally while working on the right side of the patient. The screws applied more caudally are more risky in terms of nerve damage due to the course of the nerve root and closer relation to the pedicle. That is, right handed surgeons should be more careful not to apply the screws more caudally when instrumenting on the patient's right side. Perhaps, instrumentation should be applied a little more cranially from the usual angle.

The surgeon's perpendicular standing to the patient will provide better orientation and instrumentation. Residents, who are trained in spinal surgery, should be reminded of this and should be taught that there may be practical differences in the patient's side changes.

## Handedness in Other Surgeries

The differences between the hand dominance between the physicians in the other specialties also attracted attention. Firstly, an orthopedic study on the hand dominance of the surgeon has been performed and radiological parameters has been measured. In the study, equal numbers of left and right total hip replacement has been performed by four surgeons, two right-handed and two left-handed. So as a result, they have reached a significant statistical difference on acetabular component position [12].

Mehta et al. have conducted a study about the impact of surgeon handedness and laterality on outcomes of total knee arthroplasties. And they have reported that right handed surgeon's operations on the right side on knee arthroplasty provide better clinical outcomes [13].

So we can state that hand dominance or patient pathologic side effects the outcome of surgery.

## Challenges for Surgeons

The inherent variability of each patient is a compelling reason for spinal surgery. The difference in pedicle thicknesses, pedicle width and length, sagittal and coronal balance in each patient indicates that there is not any standard practice on applying instrumentation. In addition, the difficulties experienced by left-handed surgeons are more common. Because many surgical instruments have been designed according to right handed surgeons. Occasionally, left-handed surgeons may need to perform operations in off size position and practice with unsuitable devices [14,15].

## Conclusion

Spinal surgeries may reveal different outcomes as the results depending on the surgeon's hand dominance and performing surgery on the right or left side of the patient. This variability should be known by every surgeon and it is beneficial to include them in the account when performing surgery. And also, surgeons should aware that there might be a potential risk in spinal surgeries when surgeon approach from the weak side (in case of non-dominance hand use in the majority of surgical treatment) or when right handed surgeons perform the surgery to the right side spinal lesions, or right-side instrumentation in prone position. Knowing the differences in the right or left approach in all types of operations can also reduce complications.

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