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IS EARLY RADIOLOGICAL IMAGING REQUIRED FOLLOWING SPINAL FUSION OPERATIONS?

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ABSTRACT

Objective: This study aims to determine the effect of lumbar computed tomography of the cases subjected to early postoperative lumbar fusion surgery on the re-operation rate and to establish the rate of early malposition.

Material and methods: Sixty-five cases, which underwent posterior stabilization according to indications with the operations carried out in our department between 2014 and 2017, and 476 transpedicular screws files with 238 levels were evaluated retrospectively.

Results: It was found out that, 37 cases were operated under anterior- and posterior-controlled fluoroscopy (A-P) and that only 28 cases underwent operation with laterally controlled fluoroscopy. Lumbar thin-slice bone tomography was produced for all the cases as postoperative control. It was found out that single level transpedicular screw moved from safe range to medial in seven cases, and four of these patients were taken to revision surgery due to postoperative leg pain. Two cases were determined to have single transpedicular screws moved to lateral, and revision surgery was not deemed necessary for no clinical finding was present. It was determined that nine instruments with screw malposition developed only in laterally controlled fluoroscopy cases. The length of hospital stay was calculated to be 3.1 ± 0.7 days. The screw malposition rate was 0.1 %.

Conclusion: Indication-free postoperative lumbar CT imaging for patients without any clinical finding will decrease in case A-P and lateral fluoroscopy utilization and, in particular, the interpretation of images are taught to other surgeons by spinal surgeons in clinics.

Key Words: Spinal fusion, diagnosis, radiologic imaging.

Level of Evidence: Retrospective clinical study, Level III.

INTRODUCTION

In the last two decades, the frequency of spinal stabilization and fusion surgeries against degenerative diseases and trauma has increased and established the substantial number of brain surgeries today. Such operations are conducted in order to correct spinal deformity, increase the success of fusion, support the decompression of neural elements after stabilization and facilitate postoperative rehabilitation process.

There are more than 40.000 fusion surgeries on average carried out in the USA annually for thoracolumbar vertebra. This number is responsible for approximately 20 % of all the surgical interventions implemented on lumbar region. A majority of the fusion procedures avails of spinal instrument [(4)].

Such surgical interventions frequently carried out in conjunction with lateral and anterior-posterior imaging techniques according to the convenience of operation table in C-arm fluoroscopy control. As regards to further spinal centers, pedicle screws can be placed impeccably in company with O-arm fluoroscopy and neuronavigation. Pedicle is adjacent to neural foramen and central

canal. There may be instrumental positions in surgeries without laminectomy due to puncture place or angular errors. The screw may contact neural foramen, lateral or central canal or, passing through corpus anterior, vascular structures. Though fluoroscopy frequently ensures control during surgery in most clinics, spinal surgeons and clinics generally control the instruments with a lumbar CT they create before the patient is discharged. Many surgeons traditionalized such ritual as a standard procedure for their clinics.

This study aims to determine the effect of lumbar CT of the cases subjected to early postoperative lumbar fusion surgery on the re-operation rate and to establish the rate of early malposition.

MATERIAL AND METHOD

Sixty-five cases, which underwent posterior stabilization according to indications with the operations carried out in Neurosurgery Department between 2014 and 2017, and 476 transpedicular screws files with 238 levels were evaluated retrospectively.

The cases were registered upon the evaluation of their age, sex, operational cause, operational level, transpedicular screw number, pre- and post-operative topographies, re-operational cause, operational notes and fluoroscopy controls during operation.

RESULTS

This study covers 65 patients who were subjected to posterior segmental instrumentation. The population consisted of 52 female and 13 male patients. The youngest operated case was 21 while the oldest was 77. Average age of the population of this study is 57,218 ± 14,312. The number of patients who underwent operation for T-12 fracture, L-1 fracture, recurrent lumbar disk hernia, listhesis and lumbar spinal stenosis and spondylosis was 5, 2, 10 (3 patients underwent 3 surgeries while 7 patients underwent 2 operations), 7 (5 cases had grade-1 listhesis while 2 had grade-2 listhesis) and 41, respectively. In consideration of the operational levels, the number of the patients who were evaluated as T10-L2, L1-L3, L2-L4, L2-L5, L1-L5, L3-S1, L3-L4, L5-S1, L4-L5 and L3-L5 level was 7, 1, 4, 4, 4, 5, 6, 6, 10 and 26, respectively. The total number of transpedicular screws availed of for 238 corpuses was 476.

In consequence of the evaluations, it was found out that, 37 cases were operated under anterior- and posterior-controlled fluoroscopy (A-P) and that only 28 cases underwent operation with laterally controlled fluoroscopy. Lumbar thin-slice bone tomography was produced for all the cases as postoperative control. It was found out that single level transpedicular screw moved from safe range to medial in seven cases, and four of these patients were taken to revision surgery due to postoperative leg pain. Two cases were determined to have single transpedicular screws moved to lateral, and revision surgery was not deemed necessary for no clinical finding was present. It was determined that nine instruments with screw malposition developed only in laterally controlled fluoroscopy cases. The length of hospital stay was calculated to be 3.1 ± 0.7 days. The screw malposition rate was 0.1 %.

The evaluation of postoperative complications demonstrated that bilateral drop foot developed in one case even though the screws did not violated the pedicular region. However, the case showed full recovery in terms of muscle strength in the follow-up of the following days. Five cases developed postoperative deep wound site infection. These cases started intravenous antibiotherapy upon consultation with Infectious Diseases. The cases were hospitalized and daily infection indicators were followed. Two cases that developed infection in wound site were re-operated and were treated with wound site revision, debridement and irrigation by use of two thick drainages. One case developed closed cerebrospinal fluid (CSF) fistula but was discharged without a complaint after no deficit was found in the follow-ups

DISCUSSION

The most significant point in the surgical treatment of degenerative diseases such as vertebral deformity, vertebral tumors, spondylolisthesis and lumbar spondylosis is the re-establishment of pathological vertebral segment decompression and stabilization. In the literature, King was the first person to apply screws for facet joint stabilization in vertebra in 1944. Boucher followed him and realized the first transpedicular screw use in 1959 [9,12]. Recently, posterior transpedicular screw fixations become the standard method for spinal instrumentation.

Though it has many positive effects, spinal instrumentation may also bring along various problems based on performed surgeries and the devices used. Various complications may emerge in the early intraoperative and postoperative periods such as screw breaking, screw malposition, spinal cord injury, retroperitoneal organ injury and screw elusion [1,3].

The literature contains a wide range of articles concerning screw malposition. As regards to transpedicular screw applications, the right-place screw rate is 69-94 % in techniques that are not fluoroscopy-controlled while it is 81-92 % in fluoroscopy-controlled techniques [10-11]. Screw malposition rate was reported to be 1.1-28.2 % in radiological imagines [2].

Neurological deficits due to screw malposition are rare. A study, which evaluated 3204 screws, reported no vascular, neurological or visceral damage due to any of the screws

[5]. However, another study reported neurological deficit rate to be 0.8 % [13].

The recent studies evaluated 10.350 cases which underwent spinal instrument surgery, and reported operational indication rate due to screw malposition to be 1.12 % among 116 cases.

Revision surgery may not be necessary for each screw malposition determined in neuroimaging. However, surgery may be necessary in case medial clinical cases which contact with root and canal are determined (postoperative neural deficit increase, pain, urinary and excremental incontinence) [7].

Defensive medical applications became prevalent among physicians due to recently increasing malpractice cases, and Lumbar tomographies are produced and started to be applied as a standard procedure in many clinics even though patients has no complaint in early postoperative neurological evaluations. Martin et al. compared the cases for which cervical radiography was produced and for which no radiography was taken in the 1st day among the cases which underwent fusion surgery and anterior servikal discectomy. It was found out that neuro-imagines without clinical findings increase exposure to radiation extend the length of hospital stay and has no positive contribution to the final condition [6].

In a study, Molinari et al. retrospectively assessed the patients who they evaluated with neuroimaging during hospitalization among the cases that underwent single level spinal fusion surgery. The study concluded that neuro-imagines for cases, which do not have any postoperative complaint and neuro-deficit condition, have no positive contribution to results [8].

Our study evaluated 65 cases and 450 pedicular screws. Standard lumbar CT imaging was applied to the cases in the postoperative day (between postop 1st and 12th hours). It was found out that 12 patients had screw malposition while 1 had neurodeficit. Four cases underwent re-operation in the early postoperative hours.

In this study, all the cases were operated with preoperative fluoroscopy control. It was determined that lateral imaging alone was applied to the patients with screw malposition. The reasons why A-P imaging was applied were determined to be the tables taken to the main hall, which are not compatible with A-P imaging and the surgeons who did not prefer A-P imaging.

CONCLUSION

The routine spinal imaging required in the early postoperative period was found out to be a process that does not contribute to the final condition in cases with intact neurological examination and no complaint and that increases the exposition to radiation and the length of hospital stay to a certain extent. However, it was revealed that fluoroscopy-controlled lateral and A-P imaging during lumbar stabilization surgery could decrease the rate of screw malposition. We believe that indication-free postoperative lumbar CT imaging for patients without any clinical finding will decrease in case A-P and lateral fluoroscopy utilization and, in particular, the interpretation of images are taught to other surgeons by spinal surgeons in clinics.

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