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Research Article

Considerations for the Positioning of the Surgeon for Anterior Cervical Surgical Approach

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Abstract

Aim: Outcome after anterior cervical spine procedure strongly depends on the mode of surgery used. Among other factors, the position of the surgeon is crucial for the achievement of an optimal result, as different pathologies require different approaches. We conducted the present study to demonstrate two different positions of the surgeon during the Anterior Cervical Discectomy and Fusion (ACDF) procedure and to compare the consecutive outcomes depending on the approach used.

Methods: Data of patients undergoing ACDF procedure at the Department of Neurosurgery at Sana Hospital Duisburg, Germany, were retrospectively analyzed according to the position of the surgeon. Two different approaches were used: the surgeon was positioned either at the Top (T) or at the Shoulder (S) of the patient. Duration of surgical procedure, symptom relief and complication rates were compared between the two approaches using students t-test.

Results: A total of 193 patients were identified for the present study; 120 received a (S) and 73 a (T) ACDF approach. The median number of accessed levels was 2, most patients complained from cervical radiculopathy (57.7%). Following surgery, symptoms improved in 33.1% of all patients ($p<0.001$). Complication rate was low, 14% of all patients required a second surgery. There was no difference in length of surgery, symptom relief or complication rates between the two surgical groups.

Conclusion: Both approaches are equally safe and feasible. Outcome following ACDF procedure did not differ between the two methods applied. However, the approach differed depending on the underlying pathology and thus, the position of the surgeon should be taken into account and communicated to the surgical team including nurses and anesthetist prior to the surgical procedure.

Introduction

Cervical surgery has changed during the last few decades [1]. In former times, dorsal approaches like laminectomy and Frykholm approach to the nerve root were common [2]. With the introduction of the ventral Robinson-Smith or Cloward approach complication rates- especially myelon damage -could be prevented [3-6]. Currently, classic cervical surgery for disc herniation is done ventrally with fusion techniques [7-9]. There are two different variations of surgeon positioning during performance of ventral cervical surgery. In the first variation, the surgeon is positioned at the head of the patient, over the top. In the second variation, the surgeon stands at the shoulder of the patient. The reasoning for either positioning is educational, preference of the surgeon or the underlying pathology. In order to prevent delay of the surgical procedure, the position of the surgeon should be communicated to the surgical theater personnel as well as to the anesthetist. What are advantages and disadvantages of each approach? **Coming from over top**, the surgeon operates in the line of the cervical spine which improves orientation and angulation for plate implantation and fixation. It is easier for resection downwards and visualization of osteophytes on the lower vertebra compared to those of the upper vertebra is better. This has to be kept in mind when planning a surgery for anterior spinal pathology with osteophytic material located at the base of the plate. Ventilation tube has to be fixed in the left corner of patient's mouth to prevent obstruction of the surgeon's visual field and in order not to obstruct the movement perimeter. The screen for x-ray control has to be positioned at the end of the table near to the patient's feet. Assisting physician is positioned left of the surgeon. It is possible that the operating surgeon rotates slightly between the x-ray and the patient's head in

order to get further angulation. Examples for patient-, ventilation tube- and surgeon positioning can be found in Figures 1 and 2. **Coming from the shoulder** has the advantage to operate upwards and from right to left. This is especially helpful if surgery is performed in kyphotic deformation of the spine or in patients with a Bechterew disease. It is also used for screwing of dens fractures. Obviously, the osteophytes on the upper vertebra can be reached easier and the root on the contralateral is easier to decompress. It is also possible to combine both approaches during surgery e.g. in multi-level resection of ventral osteophytes in a kyphotic patient where both approaches have been combined in order to achieve an optimal surgical result. Examples for the positioning of the ventilation tube and surgeon's position in the shoulder approach can be found in Figures 3 and 4.

Figure 1: Illustrates the position of the ventilation tube in T-approach.

Figure 2: The position of the surgeon and the assistant physician during T-approach is shown in Figure 2.

Figure 3: Position of the ventilation tube in the S-approach can be found in Figure 3.

Figure 4: In the S-approach, the surgeon is standing in the shoulder of the patient.

For the present study, we analyzed all patients who received an Anterior Cervical Discectomy and Fusion (ACDF) procedure at our department during throughout two years and compared the outcome of the two different approaches taking into account the length of the surgery, symptom improvement and complication rate.

Materials and Methods

For the present study, all ACDF procedures performed at the Department of Neurosurgery at the SANA Hospital Duisburg between 2019 and 2021 were analyzed. Preoperative assessment

involved a recent (at the latest one month prior to surgery) Magnetic Resonance (MR) scan, lateral flexion and extension X-ray scan, clinical investigation and history. A conservative approach including analgetic agents and/or physiotherapy failed in all patients, thus, surgery was voted for during out patient consultation. A retrospective analysis was performed taking into account the approach method shoulder (S) or top (T), clinical pathology (cervical stenosis vs. disc herniation or combination of both), number of levels, total time of surgery and rate of morbidity including revision procedures. We then compared the data according to the surgical approach using unpaired student t-test or X^2-test. Computation of statistics was done by using SPSS Version 22.0 (SPSS Inc., Chicago, Illinois, USA).

Results

A total number of 193 patients with a ACDF procedure could be identified. 120 received a S-approach and 73 patients a T-approach. Patient age ranged between 20 and 93; 102 patients were male and 91 female. The median number of surgically accessed vertebral levels was 2 (mean 1.6), 109 patients suffered from a considerable cervical stenosis, 59 patients presented with disc herniation and 20 patients had a combination of both pathologies. There was no statistically significant difference in these parameters between the two surgical approach groups. The median surgery time was 122.0 minutes (mean 129.3; range 51.0-297.0), 125 (mean 131.3) in the S group and 117 (mean 126.2) in the T group ($p = 0.45$). At admission time, 112 patients complained from pain, 84 from paresthesia or paresis (n=82). A symptom relief at the time of discharge was observed in 33.1 % of all patients: significant improvement was observed for pain ($p < 0.001$). Paresis and paresthesia did not improve during the observation period of 6 weeks ($p=0.37$ and $p=0.91$, respectively). The overall morbidity rate was 20%: 7.7% bleeding, 7.2% misposition of cage and 5.1% infection. 27 (14%) patients underwent a revision surgery. No difference in the complication or revision rate was observed between the two groups. A detailed patient characteristics can be found in Table 1.

	Total (n =193)	S-group (n =120)	T-group (n = 73)
Number of levels (n, %)			
1	90 (46.6)	56 (46.7)	34 (46.6)
2	93 (48.2)	58 (48.3)	35 (47.9)
>=3	10 (5.2)	6 (5.0)	4 (5.5)
Type of surgery (n,%)			
PEEK cage	114 (58.5)	67 (55.8)	47 (64.4)
PMMA	76 (39.0)	52 (43.3)	24 (32.9)
Corporectomy	3 (1.5)	1 (3.3)	2 (2.7)
Length of surgery (mean, min)	129.3	131.3	126.2
Pathology			
cervical stenosis	109 (56.5)	65 (54.2)	44 (60.3)
disc herniation	59 (30.6)	38 (31.7)	21 (28.8)
combination of both	25 (12.9)	17 (14.1)	8 (11.0)
Symptoms			
prior to surgery (n,%)			
pain	112 (58.0)	71 (59.2)	41 (56.2)
paresis	84 (43.5)	48 (40.0)	36 (49.3)
paresthesia	82 (42.5)	57 (47.5)	25 (34.2)
post surgery (n,%)			
pain	52 (26.9)	32 (26.7)	41 (56.2)
paresis	81 (42.0)	45 (37.5)	36 49.3
paresthesia	81(42.0)	49 (40.8)	32 (43.8)
Revision surgery (n,%)	27 (14.0)	14 (11.7)	13 (17.8)

Table 1: Patient characteristics.

Discussion

Cervical disc herniation caused by a degeneration of disc material and uncovertebral joints often leads to cervical radiculopathy due to compression of the nerve roots within the foraminal canal [10,11]. While the resulting neck and arm pain are often self-limiting, some patients present with unbearable pain as well as arm muscle paresis, often requiring surgical intervention [12-14]. Furthermore, age-related degenerative processes involving the formation of intraspinal ostheophytic material lead to a spinal canal stenosis resulting in myelopathic conditions including gait disturbance and impairment of fine motor skills, making surgery inevitable in order to improve quality of life and preserve motor function [6,15]. Since first description in 1955 by Smith and Robinson followed by 1958 Cloward, ACDF procedure in its modified mode (usually involving a cage instead of the originally described bone fragment) has proven to be a safe, fast and standardized procedure and now is widely performed in both pathologies [1,3,5,7].

In the present study, we addressed the previously unanswered question whether a modification of the surgical approach, namely the position of the operating surgeon, might influence surgical outcome. Our data show that both, the S and T approaches can be used in ACDF procedure providing comparable results in terms of operating times, surgical and clinical outcome, as well as morbidity and revision rate. The preference of the surgeon as well as the underlying pathology (kyphosis, M. Bechterew, position of the osteophytes) should be taken into consideration when choosing the most suitable approach. Ergonomic aspects are of extreme importance in planning and performing surgery and an improvement of ergonomics usually results in an improvement of the surgical outcome [16,17]. Technical aspects, such as the use of navigational and robotic techniques, though not very common for ventral surgical approaches to the cervical spine, should be considered when planning the consecutive procedure. Furthermore, it is important to communicate which method will be chosen for the particular case to provide maximal safety in the operating room. The nurses as well as the anesthetist have to be informed about the planned approach due to different tube fixation, foot paddle position and screen position in each approach. The knowledge of both variations and consecutive pitfalls should be taught to the team to improve variability in surgical approach individualized to the patient's pathology and surgeon's needs.

Disadvantage of introducing both techniques in a team lies in the education of the residents as it could cause possible confusion in the beginning of surgical training. Thus, we recommend to start the education with the over the top technique and bring in the shoulder technique at a later timepoint. A limitation of the study lies in its retrospective, single-center design as well as slightly different numbers of cases in the two approaches groups and further studies encompassing multiple neurosurgical institutions are needed to compare the outcomes of the two different approaches.

References

1. Denaro V, Di Martino A (2011) Cervical spine surgery: an historical perspective. Clin Orthop Relat Res 469: 639-648.
2. Frykholm R (1951) Lower cervical vertebrae and intervertebral discs; surgical anatomy and pathology. Acta Chir Scand 101: 345-359.
3. Cloward RB (1958) The anterior approach for removal of ruptured cervical disks. J Neurosurg 15: 602-617.
4. Wong JJ, Cote P, Quesnele JJ, Stern PJ, Mior SA (2014) The course and prognostic factors of symptomatic cervical disc herniation with radiculopathy: a systematic review of the literature. Spine J 14: 1781-1789.
5. Bohlman HH, Emery SE, Goodfellow DB, Jones PK (1993) Robinson anterior cervical discectomy and arthrodesis for cervical radiculopathy. Long-term follow-up of one hundred and twenty-two patients. J Bone Joint Surg Am 75: 1298-1307.
6. Carette S, Fehlings MG (2005) Clinical practice. Cervical radiculopathy. N Engl J Med 353: 392-399.
7. Bono CM, Ghiselli G, Gilbert TJ, Kreiner DS, Reitman C, et al. (2011) An evidence-based clinical guideline for the diagnosis and treatment of cervical radiculopathy from degenerative disorders. Spine J 11: 64-72.
8. Heckmann JG, Lang CJ, Zobelein I, Laumer R, Druschky A, et al. (1999) Herniated cervical intervertebral discs with radiculopathy: an outcome study of conservatively or surgically treated patients. J Spinal Disord 12: 396-401.
9. Cauthen JC, Kinard RE, Vogler JB, Jackson DE, DePaz OB, et al. (1998) Outcome analysis of noninstrumented anterior cervical discectomy and interbody fusion in 348 patients. Spine 23: 188-192.
10. Sugawara O, Atsuta Y, Iwahara T, Muramoto T, Watakabe M, et al. (1996) The effects of mechanical compression and hypoxia on nerve root and dorsal root ganglia. An analysis of ectopic firing using an in vitro model. Spine (Phila Pa 1976) 21: 2089-2094.
11. Scotti G, Scialfa G, Pieralli S, Boccardi E, Valsecchi F, et al. (1983) Myelopathy and radiculopathy due to cervical spondylosis: myelographic-CT correlations. AJNR Am J Neuroradiol 4: 601-603.
12. Radhakrishnan K, Litchy WJ, O'Fallon WM, Kurland LT (1994) Epidemiology of cervical radiculopathy. A population-based study from Rochester, Minnesota, 1976 through 1990. Brain 117: 325-335.
13. Mochida K, Komori H, Okawa A, Muneta T, Haro H, et al. (1998) Regression of cervical disc herniation observed on magnetic resonance images. Spine 23: 990-995.
14. Saal JS, Saal JA, Yurth EF (1996) Nonoperative management of herniated cervical intervertebral disc with radiculopathy. Spine 21: 1877-1883.
15. Bush K, Chaudhuri R, Hillier S, Penny J (1997) The pathomorphologic changes that accompany the resolution of cervical radiculopathy. A prospective study with repeat magnetic resonance imaging. Spine (Phila Pa 1976) 22: 183-186.
16. Demetriades AK, Meling TR, Ringel FA, Schaller K (2020) Postural Ergonomics and Micro-Neurosurgery: Microscope Has an Edge Over Loupes. J Am Coll Surg 231: 300-301.
17. Damodaran O, Lee J, Lee G (2013) Microscope in modern spinal surgery: advantages, ergonomics and limitations. ANZ J Surg 83: 211-214.