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Evaluation of the Use of Drain in Anterior Cervical Disc Fusion Procedures

Rodrigues Junior Jose Carlos*, Da Silva Vithor Ely Bortolin, De Campos Marcelo Ferraz

Department of Neurosurgery, Heliopolis Hospital, Sao Paulo, Brazil

Email address:

josecarlosncr@gmail.com (R. J. J. Carlos), vithorely@gmail.com (Da S. V. E. Bortolin), ferrazcampos@uol.com.br (De C. M. Ferraz)

*Corresponding author

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Abstract: *Introduction*: The worldwide tendency is to minimize surgical treatments, providing lesser incisions, length of hospitalization and complications. Anterior cervical arthrodesis (ACA) is a very common procedure realized daily in many services. One of its most dread complications it's the cervical hematoma that in severe cases need urgent evacuation and can lead to higher morbidity and even death. Despite of this is not a consensus between surgeons to use or not a drain in ACA. We retrospectively analyzed the use of a drain in patients submitted to ACA and evaluate the results of minimizing cervical collections caused by the lowest symptomatology in the post-operative period. *Materials and Methods*: Fifty-four patients submitted to ACA in one or more segments were retrospectively evaluated, through the analysis of medical records, examinations, surgical descriptions, as well the output of each drain in the postoperative period, conditions of the surgical wound (presence or not of bulging) and postoperative symptomatology (swallowing and local pain). The data obtained were submitted to statistical analysis. *Results*: 54 patients underwent ACA. The overall mean volume of cervical drain was 28.56 mL (10 - 90 ml). A direct relationship was observed between the number of levels operated and the mean drain output: 1 level=12.86 ml; 2 levels=27.88 ml; and 3 levels=32.60 ml with statistical significance ($p<0.0001$). In all patients, minimal or no cervical bulging, nor dysphagia was observed. *Conclusion*: We conclude that the use of the drain in ACA reduces the cervical collections, regardless of the number of segments addressed, causing less postoperative symptomatology with consequent decrease in hospitalization time, and because independent of levels we observed significant accumulation of blood we recommend that every surgeon dealing with ACA must use routinely a drain.

Keywords: Cervical Disc Herniation, Anterior Approach, Drain

1. Introduction

Surgical treatment of cervical disc herniation by the anterior route is shown to be the first choice. However, in cervical spinal surgery, due to the proximity to vital respiratory structures, there has always been a concern with the formation of edema or hematomas, due to the risk of extrinsic compression and respiratory failure, putting the patient's life at risk. In addition, respiratory compression would lead to intubation and its possible complications, increasing the length of stay and treatment costs. [1]

Postoperative bleeding after anterior cervical fusions may prolong hospitalization and may at times cause symptomatic retropharyngeal hematoma formation leading to airway obstruction and in some cases even death. Meticulous hemostasis and reduction in postoperative bleeding, therefore, is crucial and plays an important role in the success of anterior cervical fusions.

Retropharyngeal hematoma is the most feared complication and usually occurs about 12 hours after the surgical procedure and requires urgent surgical re-approach due to the imminent risk of death of these patients due to airway obstruction. [1]

As a preventive therapy, drains are used to remove blood and fluids from the surgical site [2] via a drainage tube connected to a suction collection tank after the air is removed from the interior. They are inserted at the time of surgery and aim to decrease the accumulation of blood and lymph inside the wound, improving local healing and preventing complications.

The premise that drains would reduce the incidence of postsurgical complications is a logical one to assume. Theoretically, hematoma formation, in an enclosed wound space, provides an ideal medium for pathogenic colonization. In addition to the risk of infection, hematomas can also induce major neurological complications such as cauda equina syndrome. By inserting a drain, and providing a conduit for hematomas to culvert, the incidence of complications should decrease. [2]

In this study, a drain was used in patients undergoing anterior cervical arthrodesis to evaluate the results of minimizing cervical collections, causing less postoperative symptoms such as difficulty in swallowing, pain and local edema and thus reducing the length of hospital stay.

2. Materials and Methods

In this series of cases, 54 patients during the year of 2013 underwent cervical arthrodesis through the anterior route of one or more segments using intersomatic devices and a postoperative suction drain.

The patients eligible for the study had degenerative cervical spondylotic myelopathy with treatment performed through a 4cm cross-section incision medially to the edge of the sternocleidomastoid muscle. Cervical discectomy followed the technique described by Smith-Robinson in 1955, but with the placement of an intersomatic device and subsequent allocation of an intraoperative suction drain in the surgical bed that remained for 24 hours in the postoperative period. The surgery also had the aid of optical magnification instruments such as a magnifying glass and microscope.

Through the analysis of medical records, exams, surgical descriptions, as well as recording the total drainage of each drain 24 hours after surgery, conditions of the surgical wound (presence or absence of bulging) and postoperative symptoms (swallowing and local pain), the results were compared with the number levels covered.

The data obtained were submitted to statistical analysis using the Shapiro-Wilk and Kruskal-Wallis tests and compared with the data present in the literature after a database review using the descriptors "cervical wound drain" and "postoperative complications".

3. Results

From this retrospective analysis of the 54 patients, they were divided in terms of the number of levels approached by cervical arthrodesis anteriorly into one (7 patients, 13%), two (17 patients, 31.5%) or three levels (30 patients, 55.5%) and the outcomes considered were compared (conditions of the surgical wound, symptoms, and total drainage 24 hours after surgery).

The overall average drained volume from the cervical drain was 28.56 ml (ranging from 10–90 ml). A direct relationship was observed between the number of operated levels and the average drained volume: 1 level, 12.86 ml; 2 levels, 27.88 ml; and 3 levels, 32.60 ml respectively, with statistical significance ($p < 0.0001$) to the statistical analysis performed (Table 1).

Table 1. *Results.*

LEVELS	TOTAL OF PATIENTS (N=54)	AVERAGE DRAINAGE (Vm=28,56 Ml)
1	7 (13%)	12,86 ml
2	17 (31,5%)	27,88 ml
3	30 (55,5%)	32,6 ml

Shapiro-Wilk test: p=0,00000539
Kruskal-Wallis test: p=0,000512.

As for the subjective data, in none of the patients, there was a complaint of dysphagia or pain at the site, as well as no cervical bulging, and all patients were discharged 24 hours after the procedure, reflecting that no hematoma was formed.

4. Discussion

Anterior cervical discectomy and fusion (ACDF) is a widely practiced surgical procedure used to remove degenerative or herniated disks from the cervical spine. More than 500,000 ACDF procedures were performed during 1990 to 1999 in the United States alone. The clinical outcome of this procedure is good or excellent in most cases [4]. Although the anterior portion of the neck contains vital structures, this approach facilitates improved visualization and complete disk removal as opposed to a posterior approach. [1, 2]

Surgical treatment of cervical disc pathologies has great efficacy when properly indicated and performed, with the surgeon having a strategic intelligence that anticipates possible complications. Because of the large number of reported positive clinical series of patients undergoing ACDF, a false impression can be given that ACDF is a complication-free procedure. (1) Among them, dysphagia is the most common (1.7% -9.5%), being more common in multi-level surgeries [5], and postoperative hematoma should be ruled out as its main cause.

In a study with 1015 patients, fifty-seven patients (5.6%) developed clinically evident postoperative soft tissue hematoma (presented with severe dysphagia, respiratory difficulties, and/or painful neck swelling). In 24 of these patients (2.4%), an emergent surgical evacuation was required, whereas in the remaining 33 patients (3.2%), conservative management with close observation was used. [2]

Postoperative drains remove blood and debris from the surgical site and theoretically prevent hematoma formation, reducing the risk of infection and wound breakdown. [8]

The use of drains in cervical spinal surgery is controversial in the literature. By the posterior route Herrick et al. demonstrated, after evaluating 1799 patients undergoing surgery with instrumentation, 65.5% of them using a drain, that this measure reduced the rate of postoperative infection and the chance of reoperation by 50% [4].

In the setting of cervical spine surgery, postoperative drains have traditionally been thought to play a critical role

due to theoretical incision healing benefits. Given the proximity of the cervical approach to vital respiratory structures, drains have primarily been used with the hope of preventing potentially fatal respiratory obstructions secondary to excessive edema or hematoma formation [8]. In a German study, only 58% of the surgeons routinely use drains in ACDF. [3].

In a study with 50,926 patients with cervical discectomy and anterior fusion, it was observed that the infection rate is 0.27% [6]. In line with these data, a literature review showed a prevalence of infection of 0.9% (95% CI, 0.2% -2.8%) [7] and of postoperative hematoma between 0.1 and 3% (2,7). Therefore, some studies argue that the use of drains would be unnecessary due to the low frequency of complications of these approaches [1, 8, 9]. More recently, Lim et. al. demonstrated that the placement of percutaneous drainage increased the length of hospital stay [8]. Therefore, some studies argue that the use of drains would be unnecessary due to the low frequency of complications of these approaches [1, 8–10].

Basques et al. reported that the amount of postoperative drain output is positively correlated with increasing patient age, positive smoking history and number of cervical levels operated upon, for them, it's important to note surgery specific factors such as these, which may deem the use of drainage sensible. [2]

Although many surgeons agree with the benefits of using a drain in a questionnaire conducted in Germany, about 41% stated that they do not use a drain in previous cervical discectomies, claiming its use only if there is intense intraoperative bleeding [3]. This is based on the fact that the use of the drain is associated with a greater need for blood transfusion and hospital stay [11].

However, depending on the number of levels approached, an average of 28.5 ml of residual hematoma was observed, with cases reaching up to 90 ml. These values reflect a technique with a small aperture and exposure, considering that in conventional techniques, Wen et. al. demonstrated that after 48 hours of previous cervical surgery, there is an average of 79.7 ml of volume in the collecting drain [13]. Other authors show that the drained collection can reach up to 300ml, mainly in patients with high body mass index and in multiple-level surgeries [12].

According to Epstein N., the postoperative hematoma occurs between 1.3 and 5.6% of patients, with 43% of these (2.4%) needing emergency drainage of the hematoma [5]. This bleeding can lead to prolonged hospitalization, worsening neurological deficit and even result in severe airway compression, which can lead to death. Bertalanffy and Eggert reported that only 1.3% of their patients developed postoperative hematoma. They used a closed drainage system in all their patients for 48 hours after surgery [14]. This result was also confirmed in other studies that showed a reduction in the incidence of hematoma requiring surgical drainage in patients with drain, from 1.1% to 0.7%, which represented an absolute risk reduction of 0.4% and a relative risk reduction of 47% [15].

In our study, we found that there was a direct relationship between the number of operated levels and the average drained volume: 1 level, 12.86 ml; 2 levels, 27.88 ml; and 3 levels, 32.60 ml respectively, with statistical significance. And because of this no hematoma was observed. With this in mind, we routinely recommend the use of drain in ACA to alleviate patients' symptoms that could occur because of this accumulation.

5. Conclusion

Anterior cervical spine surgery is a very common procedure which the most dreadful complication it's the hematoma formation in the post-operative period and that could be prevented by correct hemostasia and the use of a drain.

In this study we observed that the use of the drain in the surgery of the cervical disc herniation by anterior route with arthrodesis is mandatory, considering that the volume of drainage is proportional to the levels addressed, reduces the cervical collections, regardless of the number of segments addressed, causing less postoperative symptoms with a consequent decrease in the length of hospital stay and recovery of our patients.

6. Recommendations

Because of the higher frequency of anterior cervical procedures, we strongly recommend the routine use of drain to avoid potential complications as demonstrated by our work and the literature. Our series isn't too big but reflect a great tendency of decreasing these complications with the use of drains in ACA procedures, larger series are waited to confirm this results.

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