

The role of drains in adolescent idiopathic scoliosis surgery

Is it necessary?

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Abstract

Close suction drainage systems are widely used in orthopedics and spine surgeries. There are less studies investigating the outcomes of using subfascial closed suction drains in adolescent patients who had undergone idiopathic scoliosis surgery. We evaluated the outcomes of patients with and without closed suction drainage and to investigate whether close suction drainage is needed after adolescent idiopathic scoliosis (AIS) surgery.

We retrospectively investigated 63 patients, who underwent posterior spinal surgery for AIS from January 2015 to January 2018. The patients were divided into the following groups: Groups A (drainage group) and B (nondrainage group). We evaluated the wound drainage (wound oozing), need for transfusion, preoperative and postoperative hemoglobin levels, length of hospital stay, and postoperative blood loss from closed suction drains. Patients' scoliosis was categorized according to the Lenke Classification System for Scoliosis. The level of instrumentations was also evaluated.

The median postoperative hemoglobin level was lower in group A than in group B. Postoperatively, group A underwent more blood transfusions than group B. Postoperative hospital stay was also significantly longer in group A than in group B. There was no statistical difference in the infection rate between the two groups.

Using drains after AIS surgery increases hospital stay duration, blood transfusion rate and patients' anxiety of drain tube removal. Thus, closed suction drainage may not be suitable after AIS surgery.

Abbreviations: AIS = adolescent idiopathic scoliosis, g/dL = gram/deciliter, IQR = interquartile range, mL = Milliliter, RBC = red blood cell, ROM = range of motion, THA = total hip arthroplasty, U = unit.

Keywords: adolescent, drainage, idiopathic scoliosis

1. Introduction

Closed suction drainage is widely used to aspirate fluids in third spaces after spinal surgeries and other orthopedic surgeries and is thought to prevent hematoma and wound complications. Hematoma may result in cauda equina compression and neurologic deficits, which were reported to be prevented by using closed suction drainage. However, the use of closed suction drainage after surgery remains controversial.^[1]

Many articles have reported the benefit of drainage in orthopedic surgeries and its role in wound healing and decreasing infection rates.^[2] Despite its beneficial effects on wound healing, closed suction drains can cause postoperative pain, anxiety, and discomfort. Moreover, drains allow migration of bacteria from the internal to the external environment, thereby predisposing the patients to local infection. Additionally, these closed suction drains are essentially considered foreign bodies, which could also lead to surgical site infections and inflammation post-surgery. These complications outweigh the purpose of using drains.^[2]

Randomized controlled studies have shown that closed suction drainage does not decrease the incidence of wound complications. Instead, patients with drains are at risk for more blood loss and increased postoperative blood transfusion rate compared with non-drainage patients.^[3,4] Walid et al found that using drains is significantly associated with post-hemorrhagic anemia and allogeneic blood transfusion, but it does not increase the patients' risk for wound infection. They also found an increased prevalence of postoperative fever associated with drain use, which may be due to the nature of the drain as a foreign body.^[5] However, to the best of our knowledge, there is no study investigating the outcomes of using closed suction drains in adolescent patients who had undergone idiopathic scoliosis surgery.

Drains are commonly used to minimize postoperative hematomas and complication after spinal surgery. Despite lack of data for proving drain's efficacy, drains become a commonplace and considered as a "duty-of-care" in spinal surgery. In contrast, the use of drains also carries the risk for potential complications, such as iatrogenic trauma due to drain placement

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problems, increased risk of infection, removing difficulties of drain (which may require a second surgery), and excessive postoperative bleeding. Recent articles do not recommend routine drain use, they claim that drains do not reduce postoperative complications.^[6–13]

Recently, a prospective study showed that subfascial drainage has no benefit over no drainage for patients with adolescent idiopathic scoliosis (AIS). They found that the incidence of wound healing complications was low and identical for the “drain” and “no-drain” groups.^[6]

The purpose of this retrospective study is to evaluate the outcomes of patients with and without closed suction drainage and to investigate whether closed suction drainage is needed after AIS surgery.

2. Methodology

We retrospectively investigated 63 patients, who underwent posterior spinal surgery for AIS from January 2015 to January 2018. Exclusion criteria were as follows: patients younger than 14 years and those older than 18 years, with thrombophilia or any kind of coagulopathies, with spinal anterior column osteotomy, with postoperative neurological deficit, those requiring postoperative intensive care unit admission, with inadequate follow-up, and with incomplete hospital records. As a result, we included 52 adolescents in the analysis.

The patients were divided into the following groups according to whether postoperative drains were attached: group A (28 patients; drainage group) and group B (24 patients, nondrainage group). All patients had pneumatic compression devices during the preoperative period. All patients wore compressive stockings post-surgery for 4 weeks and started ankle and knee range of motion (ROM) exercises post-surgery whenever possible. All patients were encouraged to mobilize at the first 24 hours post-surgery.

Only one subfascial drain inserted intra-operatively in the drainage group. All drains were removed once no fluid can be drained anymore or drained fluid amount was <50 mL/day.

We evaluated the wound drainage (wound oozing), need for transfusion, preoperative and postoperative hemoglobin levels, length of hospital stay, and postoperative blood loss from closed suction drains. Patients' scoliosis was categorized according to the Lenke Classification System for Scoliosis. The level of instrumentations was also evaluated.

In our institution, the protocol for red blood cell (RBC) transfusions was to transfuse 1 U at a time to maintain the hemoglobin concentration of <8.5 g/dL. No fresh frozen plasma or platelets were transfused to any of the patients.

All patients underwent similar standardized posterior spine exposure technique during the operation. Moreover, the standardized closure technique performed was aimed at eliminating dead spaces. A 2 to 4 mm drain tube was placed under the fascia preoperatively in the drainage group, and the drain was attached to a closed suction reservoir. All patients were administered a prophylactic, 48-hour course of antibiotic treatment postoperatively.

2.1. Statistical analysis

Descriptive analysis performed to provide information on the general characteristics of the study population. Kolmogorov–Smirnov test was used to evaluate whether the distribution of the

variables was normal. Mann–Whitney *U* test was used for the comparison of the continuous data between groups. Continuous variables were presented as median and interquartile range (IQR) (quartiles 1–3). Categorical variables were compared using the Chi-squared test and were presented as a count and percentage. A *P*-value <.05 was considered significant. Analyses were performed using commercial software (IBM SPSS Statistics, Version 23.0. Armonk, NY: IBM Corp.)

It is a retrospective study and this research has been approved by the Institutional Review Board of the authors' affiliated institutions (Sakarya University Medical Faculty).

3. Results

3.1. Demographic data

Twenty-eight patients comprised group A, with 13 male and 15 female patients. The median age was 15 (14–16) years. Twelve patients were classified as having Lenke Type 1, 10 as having Lenke Type 2, 1 as having Lenke Type 3, and 5 as having Lenke Type 5. The median instrumentation level was 11 (10–12), and the median follow-up was 43.5 (27–60.5) months.

Twenty-four patients comprised group B, with 17 male and 7 female patients. The median age was 14.5 (14–16) years. Thirteen patients were classified as having Lenke Type 1, five as having Lenke Type 2, four as having Lenke Type 3, and two as having Lenke Type 5. The median instrumentation level was 11 (11–12). The median follow-up was 23 (16–38.5) months.

The demographic data are shown in Table 1. The mean age in both groups was similar. Distribution according to Lenke classification was also similar in both groups. The median follow-up period was longer for group B.

Table 1

Comparisons of patient characteristics between the drainage and non-drainage groups.

	Drainage group (n=28)	Non-drainage group (n=24)	<i>P</i>
Age	15 [14–16]	14.5 [14–16]	.721
Follow-up duration/month	43.5 [27–60.5]	23 [16–38.5]	.014
Amount of drained fluid (mL)	400 [350–500]		
Drain removal time	36 [30–40]	–	–
Hospital stay length	6 [6–7]	5 [5–5]	<.001
Instrumentation level	11 [10–12]	11 [11–12]	.985
Transfusion	2 [0.5–2]	0 [0–1]	1.000
Preoperative hemoglobin	13 [12–14]	12.5 [12–14]	.149
Postoperative hemoglobin	8 [7.55–8.45]	9.1 [8.2–9.75]	<.001
Hemoglobin level differences	5 [4–6]	3.9 [3–4.55]	<.001
Gender			
Female	15 (53.6)	17 (70.8)	.322
Male	13 (46.4)	7 (29.2)	
Wound oozing			
Positive	6 (21.4)	3 (12.5)	.480
Negative	22 (78.6)	21 (87.5)	
Lenke classification			
Type 1	12 (42.9)	13 (54.2)	.625
Type 2	10 (35.7)	5 (20.8)	
Type 3	3 (10.7)	4 (16.7)	
Type 5	3 (10.7)	2 (8.3)	
Infection			
Positive	5 (17.8)	4 (16.6)	.240
Negative	23 (82.1)	20 (83.3)	

Data are shown as median interquartile range [IQR] and n (number-count) percentage (%).

3.2. Hemoglobin

The median postoperative hemoglobin level was lower in group A than in group B (8 (7.55–8.45) g/dL in group A; 9.1 [8.2–9.75] in group B). The mean hemoglobin decrease from preoperative values to postoperative values was 5 (4–6) g/dL for group A and 3.9 (3–4.55) for group B (Table 1).

3.3. Blood transfusion

Postoperatively, group A underwent more blood transfusions than group B. The median number of postoperative blood transfusions was 2 [0.5–2] U for group A, whereas, that for group B was 0 (0–1) U (Table 1).

3.4. Length of hospital stay

Postoperative hospital stay was significantly longer in group A than in group B. The reasons for longer length of hospital stay were pain and delayed mobilization. The median hospital stay was 6 (6–7) and 5 (5–5) days for groups A and B, respectively (Table 1).

3.5. Infection

Five and four patients in groups A and B, respectively, had superficial surgical site infections, but this was not statistically different between the groups. These patients required local wound debridement. After local debridement, the wound healed with wound dressing. Wound culture was negative for all cases (Table 1). None of the patients had deep infections during hospitalization and follow-up. Additionally, none developed hematoma in both groups.

The median drainage tube removal interval was 36 (30–40) hours from surgery. In our clinic the patients without drains were able to move easily and felt more comfortable than those patients with drainage tubes. Patients without drainage tubes were also not anxious of having the drainage tubes removed.

4. Discussion

Postoperative surgical site infections in spine surgery mostly occur in instrumented fusions, and its incidence ranges from 0.7% to 16%. Reducing the infection rate results in reduced hospital stay duration and incidence of second surgery.^[14] Postoperative hematoma of the surgical field is an excellent place for bacterial growth. Moreover, an epidural hematoma may result in cauda equina compression and neurologic deficit. Thus, suction drains are used to aspirate third-space collections to prevent the formation of seromas and hematomas, subsequently preventing the development of epidural hematomas and surgical site infections. Spine surgeons use postoperative closed suction drainage to decrease the potential risks of wound hematoma formation. The presence of a postoperative drain theoretically reduces the risk of infection. However, the efficacy of drains used for this purpose is controversial. Drains are also associated with postoperative migration of bacteria from the external environment to the internal environment, which may increase the risk of infection.

There are several randomized studies about the use of drains and infection rate in orthopedic surgeries.^[15] Most studies have reported that the use of drain does not prevent infection and may increase the rate of complications after surgery.^[16,17] In the study

of Alsiddiky et al, they determined the frequency of wound infection and neurological injuries in patients with idiopathic scoliosis who underwent posterior spinal fusion without use of drains. They state that wound healing is adequate without using drain for these patients. However, they did not compare the non-drainage patients with drainage patients. In our comparative study, there was no significant difference in the infection rate between the drainage and non-drainage patients, but there were significant differences found in hospital stay duration and blood transfusion rates. Non-drainage patients had shorter hospital stay duration and lesser blood transfusions than drainage patients.

Blank et al used a subcutaneous close suction drain for AIS. They claim that subcutaneous closed suction drainage can improve immediate postoperative wound care without significantly increasing blood loss and transfusion requirements for patients undergoing surgery for idiopathic scoliosis.^[18] However, the study did not mention subfascial drains, which are placed at the instrumented site and area of bleeding. In our patients, we did not use subcutaneous drains, instead we used the subfascial closed suction drains. We ensured that the fascia and muscles were saturated carefully. No hematoma or deep infection was observed in both groups in our study.

A meta-analysis compared closed suction drainage and non-drainage patients who underwent total hip arthroplasty (THA). They followed the methodological guidelines outlined by the Cochrane Collaboration when conducting their meta-analysis, and reported that closed suction drainage is not beneficial and may be harmful for elective THA.^[2]

A systematic review about the use of drains in spinal surgery demonstrated that drains do not reduce the incidence of complications in anterior cervical discectomy and fusion, posterior cervical fusion, lumbar laminectomy, lumbar decompression or discectomies, and posterior spinal fusion in adolescents with scoliosis. They also found studies reporting that the use of drains may led to complications.^[9]

A prospective randomized controlled study for revision THA compared drainage and non-drainage patients and reported that drainage patients had more postoperative blood loss, higher blood transfusion rates, and longer hospital stay durations. They did not find any benefit of closed suction drains in preventing wound complications, decreasing infection rates, and improving functional outcomes in drainage patients than in non-drainage patients.^[3]

In our study, we did not find any significant differences in wound complications and infection rate between the drainage and non-drainage patients, but drainage patients had longer hospital stay duration and higher blood transfusion rates compared to non-drainage patients.

5. Limitations

First, this study cannot address whether the patients in the drainage group had faster recovery or lesser pain in the earlier weeks post-surgery, because there were no weekly follow-up appointments after hospital discharge. Second, this study was retrospective in nature and involved a small number of patients.

6. Conclusion

Using drains after AIS surgery increases hospital stay duration, blood transfusion rate and patients' anxiety of drain tube

removal. Thus, closed suction drainage may not be suitable after AIS surgery.

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