

Is the Postoperative Horizontal Decubitus Position Following Transection of a Tight Filum Terminale in Pediatric Patients Necessary? – A Retrospective Cohort Study

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Abstract

After untethering surgery of a tethered spinal cord of a tight filum terminale, patients are usually kept in the horizontal decubitus position to prevent cerebrospinal fluid (CSF) leakage. However, the optimal period for keeping these patients in this position has not been established yet. Surgical results in two groups of pediatric patients with a tight filum terminale were retrospectively analyzed. Group A was maintained in the horizontal decubitus position for 72 h and group B was managed without being kept in this position postoperatively. A total of 313 patients underwent sectioning of a tight filum terminale. Of these patients, 144 were maintained horizontally for 72 h postoperatively (group A) and 169 were managed without this position (group B). Among the patients who were maintained horizontally for 72 h, one (0.7%) developed pseudomeningocele. No patients experienced CSF leakage in this group. Among the patients who were not horizontal, one (0.6%) developed CSF leakage and one (0.6%) developed pseudomeningocele. Maintaining patients without restriction of their position does not appear to change the rate of postoperative CSF leakage or pseudomeningocele. This suggests that maintaining patients horizontally after transection of a tight filum terminale is not necessary for preventing CSF leakage.

Key words: tight filum terminale, CSF leakage, horizontal decubitus position

Introduction

Untethering surgery of a tight filum terminale is not a complex procedure and it is usually associated with low morbidity and mortality rates. The rates of complications of this surgery have been reported to range from 0% to 13.2%.^{1–11)} A relatively serious complication of untethering surgery of a tight filum terminale is cerebrospinal fluid (CSF) leakage, which can be associated with meningitis. The rates of CSF leakage range from 0% to 8%.^{1–3,5,12)} The complication rate should be low, especially for prevention of progressing symptoms in asymptomatic patients. To prevent CSF leakage, patients are usually maintained in a horizontal position after surgery for several days. However, the optimal period for keeping patients in a horizontal position, or whether maintaining patients in this position is necessary for prevention

of complication, is unknown. Therefore, in this study, we investigated the postoperative outcome in two groups of pediatric patients with or without 72 h of remaining in a horizontal position.

Materials and Methods

We performed a retrospective review of patients who underwent untethering of a tight filum terminale and fatty filum at the Division of Neurosurgery, National Center for Child Health and Development, Tokyo, between July 2012 and December 2016. Patients were divided into two of the following groups: patients were placed in the horizontal decubitus position for 72 h postoperatively in group A and patients were not placed in this position in group B. The position of the patient in group B is not restricted. The patients were usually in 15–30° head-up position immediately after the surgery and could be in the sitting position, if they liked. The parent also could hold the patient.

The surgical indication for untethering was whether a patient had a low-lying conus (lower than the caudal

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edge of L-2) according to preoperative magnetic resonance imaging (MRI) or a normally positioned conus with symptoms of a tethered cord.

The operative procedure was described in detail in our previous study.^{2,3)} Briefly, one-level laminotomy at L-4 in younger patients or partial laminectomy of lower L-4 and upper L-5 in older patients was performed. A microscope was introduced for untethering of the filum in all cases. The filum was coagulated and cut. Samples of 5–7-mm long were sent for histological examination.

The dura was sutured using 4-0 Neurolon with interlocking stitches. Laminoplasty was performed using sutures after laminotomy or small bone particles were put back after laminectomy. The paraspinal muscles and the fascia were closed using 2-0 Surgilon to minimize the subfascial dead space. Additionally, the fascia was closed using 3-0 Surgilon and 2-0 or 3-0 Prolene by the “figure-of-8” technique. The dermal layer was approximated using 3-0 or 4-0 PDS. The epidermal layer was sutured using 4-0 or 5-0 Ethilon.

Patients who had surgery between 2012 and 2014 were kept in the horizontal decubitus position for 72 h. Patients who had surgery between 2015 and 2016 were managed without this position. Immediate postoperative MRI was performed 1–2 weeks after the operation to address the postoperative level of the conus, any intradural hematoma, or subfascial or subcutaneous fluid collection. We evaluated whether there was worsened syndromes or not by detailed observation of symptoms or the evaluation of bladder ultrasonography and/or voiding cystourethrography.

Statistical analysis was performed using the Fisher’s exact test to compare categorical variables, including the rate of postoperative complications between the two groups. Continuous variables between the two groups were compared using the Student’s *t*-test. A value of *P* < 0.05 was considered significant.

Results

During July 2012 to December 2016, 313 patients with untethering surgery for a tight filum terminale constituted 144 in group A and 169 in group B. Table 1 shows the patients’ characteristics in the two groups.

The median age in the group A was 15.5 months (range: 3–138 months). Ninety-four of these patients were boys and 50 were girls. Surgery was performed for 101 (70%) symptomatic patients and for prophylaxis in 43 (30%) asymptomatic patients. Symptoms included bladder dysfunction, urinary tract infection, constipation, stool incontinence, leg/back pain, and gait disturbance. Forty (28%) symptomatic patients

Table 1 Patients’ characteristics of the two cohorts

Patients characteristics	Duration of horizontal decubitus		<i>P</i> -value
	Group A (72 h)	Group B (0 h)	
No. of patients	144	169	
Sex			0.72
Male	94 (65)	106 (63)	
Female	50 (35)	63 (37)	
Age in months			
Mean	26.7	21.8	0.81
Median	15.5	11	
Range	3–138	3–144	
Surgical indication			0.045
Symptomatic patients	101 (70)	100 (59)	
Prophylaxis	43 (30)	69 (41)	
Level of conus			0.7
Low-lying	104 (72)	126 (75)	
Normally positioned	40 (28)	43 (25)	
Fatty filum	67 (47)	72 (43)	0.5
Postop complications			
CSF leakage	0	1 (0.6)	1
Pseudomeningocele	1 (0.7)	1 (0.6)	1

*Except for age, values are expressed as number (%).

with a normal conus level had surgery. Preoperatively, MRI showed a low-lying conus (lower than the caudal edge of L-2) in 104 (72%) patients and a filar lipoma in 67 (47%) patients.

The median age in group B was 11 months (range: 4–144 months). A total of 106 were boys and 63 were girls. Surgery was performed for 100 (59%) symptomatic patients and for prophylaxis in 69 (41%) asymptomatic patients. MRI showed a low-lying conus in 126 (75%) patients and a filar lipoma in 72 (43%) patients.

Intraoperatively, no complications were observed in either group. After surgery, the wound was carefully observed daily and cleaned with saline on postoperative day 3. The dressings were maintained until the suture was removed on postoperative day 8. Immediate postoperative MRI was performed 1–2 weeks after surgery.

Postoperative complications were as follows. In group B, one patient had CSF leakage the day after the operation. This patient was maintained in the prone position until the day after suture removal and no CSF leakage was observed after this time. Pseudomeningocele was observed by immediate postoperative MRI in one patient. None of the patients in

group A had CSF leakage. Pseudomeningocele was found in one patient. The rate of overall complications was 0.7% (1/144) in group A and 1.2% (2/169) in group B. There were no significant differences in the rates of CSF leakage and pseudomeningocele between the groups. None of the patients in either group had wound infection, or worsened bladder dysfunction or bowel dysfunction. The postoperative MRI showed slightly upper or the same position of the conus compared with that in the preoperative MRI. The mean follow-up period was 37.3 months (range: 12–65 months). No patients experienced rethethering of the filum.

Discussion

To prevent CSF leakage after surgery for a tight filum terminale, patients are usually maintained in the horizontal decubitus position for several days. The duration of this position ranged from 24 to 72 h in previous studies.^{1,4,5,12,13} The rate of CSF leakage ranged from 0% to 5.9% in those studies. In our previous study, we analyzed surgical results for a tight filum terminale in two cohorts with different durations of being in a horizontal position for 72 h and 8 days.³ None of the patients developed CSF leakage in either group. Pseudomeningocele developed in one patient who had been maintained horizontally for 8 days. The occurrence rates of CSF leakage and pseudomeningocele were not significantly different between these two groups. These results suggest that maintaining a horizontal position for longer than 72 h is not required. However, the optimal period for the horizontal decubitus position has not been established yet. The summary of the duration of maintaining a horizontal position after transection of a tight filum terminale in pediatric patients was described in Table 2.

In the present study, we analyzed surgical results in two cohorts of patients who lay in the horizontal decubitus position for 72 h and those who did not maintain this position. In the cohort who maintained the horizontal decubitus position for 72 h, one (0.7%) patient developed pseudomeningocele.

In the cohort who did not remain in this position, one (0.6%) patient developed CSF leakage and one (0.6%) developed pseudomeningocele. The number of patients in our study is not sufficient to demonstrate statistical power. To detect a significant difference in the occurrence rates of CSF leakage and pseudomeningocele in this setting, 5907 patients would be required in each group. However, our results suggest that maintaining a horizontal position after transection of a tight filum terminale is not required for preventing CSF leakage.

As mentioned previously, we consider that meticulous musculofascial closing contributes to preventing CSF leakage.³ We used three types of suture to achieve a firm, watertight closure, and eliminated the dead space under the fascia. The patient who developed CSF leakage in the present study was a 9-year-old boy. One of the reasons for CSF leakage in this patient could be that the dead space under the fascia was more extensive compared with that in those in whom CSF leakage did not occur. Because the depth of the paraspinal muscles in older children is greater than that of infants and younger children, the dead space under the fascia can be larger. Therefore, it is necessary to follow up more carefully, especially for elder children.

The results of the present study suggest maintaining patients without restriction of the horizontal decubitus position does not appear to change the rate of postoperative CSF leakage or pseudomeningocele. No duration of keeping patients flat enables their parents to hold in their arm, which may relieve patients' stress. It could lead to not only improve of postoperative quality-of-life of patients, but also shorten hospitalization, decrease the financial cost to the health care system.

There are some limitations in our study. The number of patients was not sufficient to statistically detect small differences in complications. Furthermore, the study design was a historical cohort, which can cause bias. However, we consider that the surgical procedure for a tight filum terminale has been established in our institute as mentioned

Table 2 Summary of the duration of maintaining a horizontal position after transection of a tight filum terminale and the rate of CSF leakage

Author	Year	The duration of the bed-rest	Number of cases	The rate of CSF leakage	The rate of pseudmeningocele
Chern et al. ⁵	2011	24–72 h	222	5.9% (13/222)	4.1% (9/222)
Kim et al. ¹²	2011	24 h	16	18.8% (3/16)	Not available
Ogiwara et al. ²	2012	8 days	161	0%	0.6% (1/161)
Ogiwara et al. ³	2015	72 h	116	0%	0%
	2020	No restriction	169	0.6% (1/169)	0.6% (1/169)

above and the same operator has performed the same surgical technique or closure.

Conclusion

Maintaining patients without restriction of the horizontal decubitus position does not appear to change the rate of postoperative CSF leakage or pseudomeningocele. Keeping patients horizontal after transection of a tight filum terminale is not considered to be necessary for preventing CSF leakage.

Conflicts of Interest Disclosure

The authors report no conflicts of interest concerning the materials or methods used in this study or the findings specified in this paper.

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