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Cranial Neurosurgery without Hair Removal and Shampoo Care: Retrospective Analysis of 450 Cases

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Abstract

Goal: To assess infection rate in a population of children who underwent cranial neurosurgery without hair removal.

Methods: Retrospective analysis of clinical records of children undergoing cranial neurosurgery with "shampoo care" during one year.

Results: 450 children were included. 5.55% of them had a wound complication, with only two cases of infection (0.4%). Available literature was revised to assess the effectiveness of our protocol. Wound complication and infections rates found in our experience were lower than those reported in patients treated with a standard trichotomy.

Conclusion: Cranial neurosurgery without hair removal and "shampoo care" is an effective method to reduce infection rates. This results in a shorter hospital stay, better self-esteem and improved quality of life when the child goes back to family life and school.

Keywords: Pediatric neurosurgery; Wound infection; Wound care; Shampoo care

Background

Trichotomy is a standard procedure in neurosurgery that aims at reducing infection rates. In children, psychological consequences associated to the whole head's hair removal are remarkable. Over the past twenty years the risk of infection associated to neurosurgical procedures has been thoroughly analyzed. Two negative consequences are associated to trichotomy: the loss of the natural defences offered by hair, and multiple skin lesions that increase bacterial growth. Our hospital established a protocol consisting of minimal shave associated to head washes before and after cranial neurosurgery with antiseptic shampoo, followed by daily washes with neutrum soap when the patient is discharged ("shampoo care").

Introduction

The concept that the presence of hair in surgical sites increases the risk of infection has long been accepted, not only by neurosurgeons, but also by virtually all surgeons [1-6].

Many studies have shown that shaving the head changes the normal flora in the wound area, removes the natural protective effects that hair offers in fighting bacteria, and results in minor trauma to the scalp, all of which increase the risk of infection [5,7,8].

We designed a retrospective study of children undergoing cranial neurosurgery with "shampoo care" after the surgery.

Our aim in this investigation was to present our extensive experience with cranial operations which involved minimal hair removal and shampoo care after the surgery.

We also discuss the methods we have used for neurosurgical site preparation in our cranial operations.

Materials and Methods

Figure 1: Patient underwent cranial surgery with minimal hair removal.

Our retrospective investigation was conducted in a single unit of pediatric Neurosurgery.

The study involved 450 patients who underwent cranial surgery with minimal hair removal during period of one year (1st January 2009 – 31 December 2009).

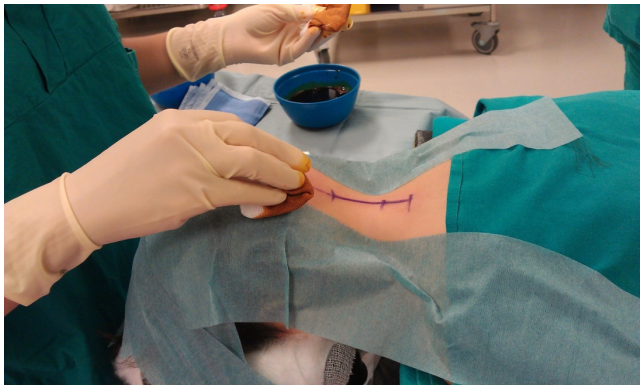

Figure 2: Nurse scrubbing hair at the site of surgery.

In the operating room, immediately prior to the operation all along the entire skin incision the surgeon or an assistant shaved minimally the site (1 centimeter width) (Figure 1). The dedicated nurse scrubbed the hair at the site of surgery and any other hair that was long enough to reach the site (Figure 2).

Scrubbing was made using a soft brush and the area was scrubbed for 5 ± 3 minutes using a cleaning solution of 10 % of alcoholic povidone-iodine in acqueos soap foam.

The eyes were protected during the scrubb with sticky drape material, and a cotton ball was placed in the external auditory canal when the head was positioned lest that the solution drain into the ears.

After drying with a sterile towel, the area was washed a second time using alcoholic povidone-iodine.

After scrubbing, we also exposed the incision site by parting the hair with a sterile drapes, before the incision was made.

Wound dressing involved the use of head netting, with sterile sponges loosely placed between the netting and the incision.

It followed the usual preparation of the operating area.

At the end of the operation, care was taken to ensure that no hair was trapped in the suture knots during skin closure.

The day after the surgery, the dressing was removed and the patient's hair was shampooed and combed into the style they had worn before the operation.

The sutures were either resorbable (Vicryl rapide™ Ethicon - johnson & johnson) or not (Ethilon™ Nylon Suture- johnson & johnson).

All patients were followed up at one or two weeks intervals after the surgery to monitor wound healing in a dedicated nurse clinic and 40 days after in a neurosurgery clinic.

Consistent with other studies in the literature, we defined the presence of infection on the basis of specific criteria, including pus at the operative site, a positive culture from a swab of the incision, development of postoperative bacterial meningitis, and or infammation in the area of the wound [6,8-9].

Results

Among 450 surgical procedures we have found 25 patients (5.5%) with a wound complication. There were 6,3% males and 4.4% females.

Pathology		Redo-Surgery	
Tumors	104	Hidrocefalus	53
Hydrocephalus	88	Tumors	35
Head injury	45	Aracnoid cist	2
Craniostenosis	92	Cranioplasty	4
Encephalocele	5	Shunt removal	5
Dermoid cyst	21	Spring removal	22
Cavernoma	8		
Arteriovenous malformation	18		
Epilepsy	20		
Arachnoid cyst	15		
Chiari 1	34		
Total	450		121

Table 1: Type of pathology for the overall surgeries and for the redo-surgeries.

Surgical procedure consisted in craniotomy mainly for tumors (104 patients), hydrocephalus (88 patients) and craniostenosis (92 patients). In 121 patients the procedure was a redo-surgery (Table 1).

About the age of patients with the wound complications 6 were younger than 2 years; 6 were between 2 and 5 years old; 6 between 6 and 10; 7 were older than ten years old.

Severe complications were 2 infections (0.4%), 2 CSF fistula (0.4%) and 8 wound dystrophy with dehiscence (1.7%). Minor complications were: swelling 5 (1.1%), inflammation 2 (0.4%) and scab formation 6 (1.3%).

Patient	Sex	Age	Kind of operation	Recurrent surgery	Kind of complication	Wound revision
1	F	6	Tumoral craniotomy	yes	Infection	no
2	F	9	Tumoral craniotomy	yes	Wound dystrohy	yes
3	F	11	Tumoral craniotomy	no	Wound dystrohy	yes
4	M	10	Tumoral craniotomy	no	Wound dystrohy	no

5	M	11	Tumoral craniotomy	no	CSF fistula	yes
6	M	11	Tumoral craniotomy	no	Swelling	yes
7	F	12	Tumoral craniotomy	no	Swelling	yes
8	M	14	Encephalocele treatment	no	CSF fistula	no
9	M	1	Encephalocele treatment	no	Scab formation	no
10	M	1	Tumoral craniotomy	yes	Scab formation	no
11	M	4	Cavernoma craniotomy	no	Scab formation	no
12	M	6	Tumoral craniotomy	no	Scab formation	no
13	M	9	Encephalocele treatment	no	Scab formation	si
14	M	11	Tumoral craniotomy	yes	Scab formation	no
15	M	6	Tumoral craniotomy	yes	Wound dystrohy	no
16	M	16	Post traumatic craniotomy	yes	Infection	si
17	M	1	Post-traumatic craniotomy	no	Wound dystrohy	no
18	F	7	Craniostenosys	no	Wound dystrohy	no
19	M	1	Hydrocephalus	yes	Inflammation	yes
20	F	3	Dermoid cyst	no	Swelling	no
21	F	9	Tumoral craniotomy	yes	Wound dystrohy	yes
22	M	1	Hydrocephalus	yes	Swelling	no
23	F	4	Tumoral craniotomy	no	Wound dystrohy	yes
24	M	9	Arachnoid cyst treatment	no	Inflammation	no
25	M	4	Posterior fossa craniectomy	no	Swelling	no

Table 2: 25 patients with wound complication.

Patients who had a wound complication were operated mainly for tumors (13 pts) and in nine patients surgery was a redo-procedure with re-opening of the same wound (Table 2).

The length of the complicated procedures was less than 1 hour in 9 cases; between 1 and 2 hours in 3 cases; between 2 and 4 hours in 8 cases; longer than 4 hours in 5 cases.

In addition, we observed no other serious problems related to the surgical preparation technique. There was a temporary hairless zone over the incision line in some patients whose wounds had been closed with non- absorbable suture; however, once we changed to closing the galea aponeurotica with absorbable suture and using staples to close the skin, this was no longer a problem.

Discussion

For a long time neurosurgeons has used the complete shaving of hair before surgery believing to reduce the risk of infections [10-12].

However, it resulted that shaving creates micro lacerations skin which increases the risk of bacterial infection and causes major psychological consequences on the patient with delayed resumption to normal daily activities in the absence of surgical complications [3].

The problem of hair removal insists on almost all the surgical specialities. The idea of a surgery without hair removal came first in gynecology with one of the first published series in 1980. It was a prospective study which reported on the outcome of 62,339 surgical wounds. They found a wound infection rate of 2.5% when the operative site was shaved with a manual razor and 1.4% when shaving was done with an electric razor. On the other hand, the infection rate was 0.9% when no shaving was done [3].

Shortly after, Zenther et al. evaluated the problem of wound infection without hair removal in neurosurgery. They observed that a wound infection was developed in 5.5% of 237 patients who had a standard wet head-shave; 3.2% of 93 patients who had a dry shave and 2.8% of 145 patients who had their hair removed with clippers [13].

Even better results in neurosurgery performed without hair removal were published in 1992 by Winston. This series of 312 patients who underwent cranial neurosurgery without hair removal had a wound infection rate of 0.3% [14] which is similar to the series of 172 paediatric procedures, described by Piatt and Steinbok with a 0.6% rate of infection [13]. Those results are similar to those obtained in our series as we found out of 450 patients operated without hair removal a risk of wound infection of 0.4%.

Braun and Richter reported a small series of 54 cranial procedures whitout hair removal and they did not report any disturbances of wound healing or septic complications [2]. Another study published in 1994, on 142 patients whose heads were not shaven before craniotomy reported a null risk of wound infections [10].

Also Sheinberg and Ross reported no wound infections in a large series of different cranial procedures which were performed without hair removal [11].

When it comes to the different pathologies, it resultes from the medical literature that second surgery of tumours and shunts revision increase the frequency of infection [5,12-16].

Randomised trials have shown that pre-operative shampooing with chlorhexidine is superior to povidone- iodine for reducing the scalp bacterial count, and that multiple pre-operative scrubs enhance this effect [15,17].

In our series using povidoneiodine scrubs in the procedures, we encountered only 2 (0.4%) wound infectious out of 450 cases, and one of these cases was an emergency operation.

Different reports in the literature have documented severe ocular toxicity related to chlorhexidine [8,18], and this is why we preferred povidoneiodine and paid special attention to protecting the patient's eyes.

Our experience, although preliminar, indicates that our protocol with povidone-iodine produces similar results to those reported in the literature with minimal shaving and a low risk for wound infection (0.4%).

Beside the risk of infection, we evaluated the quality of the wound healing. We noted a hairless area along the incision line in cases in whom the galea aponeurotica and the skin were closed with silk and nylon suture. For this reason, we converted our protocol to absorbable sutures for galea aponeurotica closure, and used the skin stapler or the absorbable suture for skin closure. After this implementation, we did not observe area of loss hair along the wound.

When it comes to the evaluation of the risk of infection and the length of the surgical procedure, even though the numbers do not allow to obtain a statistical analysis, it does not appear that a longer surgery increases the risk of infection.

They quickly returned to normal daily activities, including those outside the home.

In summary, this report demonstrates our success with leaving patient's heads unshaven during surgical preparation, a method that can be used for all types of cranial neurosurgery. The improvement of the closure of the wound using as a first choice a resorbable suture over time lead to a reduction of the risk of wound dehiscence.

The infection rate in these patients was almost identical to the rate in patients whose heads were shaved before surgery.

A prospective randomized trial is needed to confirm that this technique carries no more risk than preparation methods that involve shaving.

Clearly, patients would much rather keep their hair, and they have reacted positively to the new routine.

Overall our results suggest that craniotomy without hair removal do not increase the risk of wound infection or healing problems, as 94.5% had no complications and during the study it was possible to implement our protocol for wound closure with resorbable sutures. In terms of self-esteem, craniotomy without hair removal is better tolerated by patients of all ages.

We therefore suggest that a protocol without hair removal should be used for all cranial neurosurgical operations.

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