Hair Braids as a Risk Factor for Occipital Pressure Ulcer Development: A Case Study

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Abstract
The development of pressure ulcers in acute care settings remains an important concern, especially in high-risk populations such as patients who are critically ill and admitted to an ICU setting. In addition to immobility and other risk factors associated with critical illness, occipital pressure ulcer development has been associated with young age (neonates, infants, and young children) and patient care devices (cervical collars, bed lateral rotation). A 7-year-old boy was admitted to the pediatric intensive care unit with severe sepsis that progressed to multi-organ failure including respiratory distress requiring mechanical ventilation, cardiovascular failure requiring extracorporeal membrane oxygenation, and renal failure requiring dialysis. At 4 weeks, hair braids that were placed before admission were taken down, revealing five full-thickness occipital lesions. All wounds eventually healed, but scarring alopecia at the site of the largest wound was visible. This is the first case study describing hair braids as a potential risk factor for occipital pressure-related skin damage and suggests that if a patient is immobile and admitted with braids, patient/family and nursing staff education should include discussing the importance of releasing the hair to decrease the risk of occipital ulcers.

Keywords: case study, occipital pressure ulcer, hair braids, pediatric intensive care unit, risk factors

Current, pressure ulcers occurring in acute care settings are the focus of intense regulatory and reimbursement mandates with enhanced strategies to prevent their development in all hospitalized patients.

Occipital pressure ulcers can occur at any age. However, an increased occurrence or risk for occurrence has been associated with particular populations and care situations—eg, the critical illness and care in an ICU setting of neonates, infants, and young children; immobility; cervical collar use; and the use of a bed’s lateral rotation feature with the head pivoting on the occiput. One consequence, permanent localized hair loss, also known as scarring alopecia, may result at the healed occipital pressure ulcer site. In pediatric age groups, this hair loss has been associated with emotional distress. The case study of a critically ill young school-age child illustrates a contributing factor for the development of occipital pressure ulcers—ie, braided hair; in particular, hair braided in the style traditionally known as “track or flat braids” or “cornrows”. Although healthcare professionals informally acknowledge the potential risk this hair style poses for pressure ulcer formation, to the authors’ knowledge this case study is a first report of this risk in the literature. The popularity of braided hair styles among all age groups underscores this risk is not exclusive to pediatric populations. Prevention of braid-related occipital ulcers and the potential complication of scarring alopecia requires on-going vigilance.

Literature Review
Pressure ulcer occurrence is typically associated with particular populations or care situations. For example, in a systematic review of currently published pediatric prevalence and incidence studies, Kottner et al cite a pressure ulcer incidence of approximately 7% in the total hospitalized pediatric population and 26% in the intensive care unit setting, with prevalence ranging from 1% to 5% when Stage I ulcers were excluded.
The occiput is a bony prominence vulnerable to pressure-related tissue injury regardless of age.1-3 Because there is little subcutaneous tissue this area, tissue injury of any depth can expose the underlying bone.4 For neonates, infants, and young children <6 years of age, the occiput generally is the primary site of pressure ulcer occurrence because it is the largest and heaviest bony prominence relative to body size at these ages. However, as children grow and body proportions change, sites of pressure ulcer development are similar to adult patterns of sacral and heel involvement.5-7 In a retrospective chart review of pediatric occipital pressure ulcers, Neidig et al5 reported that 10 (six infants and four children) of the 59 children admitted to their pediatric intensive care unit (PICU) post open-heart surgery over a 12-month period developed Stage I and Stage II occipital pressure ulcers, an incidence of 16.9%. According to the authors, four variables were found to be significantly related to pressure ulcer formation: young age (<36 months), the ventricular septal type of congenital heart defect, length of intubation (>7 days), and duration of PICU stay (>8 days). During a 6-month follow-up study that included 21 infants and children, the incidence declined to 4.8% following implementation of an every-2-hour head repositioning protocol. The use of head foam cushions during surgery and of synthetic sheepskin under the head in the PICU were features of the protocol. More recently, in a multisite prospective cohort study6 that included 322 patients ages 21 days to 8 years from three PICUs, the occiput was reported as the most frequent site (37 of 199, 18%) of pressure ulcers; 26 were Stage I, nine were Stage II, and two were Stage III.

Case studies3 also have described occipital pressure ulcers as a device-related tissue injury associated with the use of cervical collars to stabilize spine injuries in adults and children. In a recent clinical pressure ulcer guideline and a case-controlled study4,6 occipital pressure ulcer development also has been associated with the use of a bed’s automated turning mode (sometimes referred to as rotation function). Instead of preventing or relieving pressure, the head pivots on the same pressure point, potentially leading to shear, friction, and tissue injury.

Physiologic alterations such as perfusion and oxygenation deficits that accompany low blood pressure and cardiac or respiratory instability contribute to pressure ulcer development. Curley et al1 found that pressure ulcers occurred in patients using mechanical ventilation and in persons with a mean arterial press (MAP) <50. In a case-controlled study of 59 PICU admissions of children ages <1 year to older than 14 years, McCord et al7 identified the following physiologic associated risk factors: patient not turned (manually by nurse) or patient turned only by use of the bed’s automated turn function. Occipital pressure ulcers accounted for 26 of the 74 pressure ulcers identified.

Gershan5 described hypoxemia and hypoperfusion treatment with extracorporeal membrane oxygenation (ECMO) in addition to immobilization as risk factors in a review of five infants whose occipital pressure ulcers progressed to scarring alopecia. Although this permanent hair loss had been previously described for adult populations, Gershan recognized the psychological impact this cosmetic defect might cause a young child over a lifetime. Self-consciousness and/or body image disturbance have been anecdotally reported.8

The purpose of this case study is to describe a young man who developed occipital pressure ulcers beneath hair braids.

Case Study

In the fall of 2009, 7-year-old Master S was seen in his local emergency room (ER) with symptoms of fever, nausea, and vomiting. He was treated with antipyretics and antibiotics for a presumed viral illness. His symptoms worsened, and 2 days later he was transferred from his community hospital to the authors’ academic medical center. Before this illness, Master S was described as a healthy young child. His diagnosis at the time of admission was sepsis. The sepsis rapidly progressed to multi-organ failure that included respiratory distress requiring mechanical ventilation, cardiovascular failure requiring ECMO, and renal failure requiring dialysis. Despite the severity of his sepsis, blood cultures did not reveal a causative organism. Rocky Mountain Spotted Fever and meningococcal sepsis were most highly suspected. Intravenous antibiotic therapy for these suspected diagnoses included ceftriaxone, vancomycin, clindamycin, and doxycycline. Master S stayed in the PICU for 52 days, during which time the effects associated with the multi-organ failure were addressed in an attempt to save his life. His medical condition was complicated by a right middle cerebral artery stroke, bilateral below-the-knee amputations (BKA) due to the sepsis, and occipital pressure ulcers.

Master S’s hair was braided in a traditional style known as track or flat braids or cornrows. In this style, the hair is braided by picking up hair in an underhand, upward motion to produce a continuous, raised row that lays close against the scalp. Hair extensions or beads can be incorporated into the braids. In general, track or flat braids may remain in place for 4 to 6 weeks with proper care.9

Approximately 4 weeks following admission, the wound ostomy continence nurse (WOCN) was consulted by the

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PICU nursing staff to assess areas of occipital skin breakdown. His mother discovered the skin breakdown as she took out braids that had been placed before his illness. At the time of the WOCN’s initial assessment, one braid overlying most of the ulcers was cut off to facilitate wound assessment. The hair around each ulcer was trimmed. A total of five areas of compromised skin were found on the occipital region. The largest ulcer measured 3 cm x 4 cm and was located at the midline of the occiput. The other ulcers extended superiorly toward the parietal bone where the smallest (0.5 cm x 0.3 cm) was located. On examination, the areas consisted of full-thickness tissue loss. Bone was palpable but not visualized. Tan adherent slough was present in the shallow wound beds; the ulcers were described as unstageable. Clinicians suggested totally shaving Master S’s head, but his mother’s wish not to remove more hair on his head was respected.

Recommendations for wound care included twice-daily cleaning of the ulcers with saline followed by the application of a broad-spectrum topical antibiotic ointment. After 3 days when all the hair had been loosened from the braids, the nursing staff and his mother were able to shampoo the patient’s hair and apply a conditioner as his mother had done weekly before his illness.

Master S spent several weeks in acute care at this facility and was discharged to a pediatric rehabilitation facility approximately 72 days after his admission and then discharged home approximately 4 months after his initial hospital admission. At the time of his discharge to home, Master S was alert and oriented. He was able to communicate with others by nodding or shaking his head. He still had his gastrostomy tube, but his tracheostomy had been removed during his rehabilitation stay. He was able to return to his local elementary school while receiving physical therapy to address his motor deficits and adaptation to his bilateral lower extremity amputations. The four smaller occipital ulcers had completely healed. The largest, midline ulcer was almost healed with scarring alopecia visible.

**Discussion**

**Risk factors.** During this patient’s PICU stay, key risk factors for pressure ulcer development in both pediatric and adult populations were present.

**Immobility.** Immobility has been identified as the most significant risk factor for pressure ulcer development. Master S was immobile. Initially, he was chemically sedated and paralyzed to facilitate mechanical ventilation. Following the stroke, he was sedated to manage seizures and increased intracranial pressure. Typically, caregivers initiate repositioning with accessory devices such as pillows, foam wedges, or gel cushions to offset the effects of unrelieved pressure on tissue. Consideration also should be given to the selection of pressure-redistributing support surfaces, such as air overlays or higher specification foam mattresses.

Master S was provided a low-air-loss support surface, and a gel cushion was placed under his head to redistribute pressure. However, options for repositioning were limited by his health-care professionals’ concerns that steady-state hemodynamic, respiratory, and intracranial pressure (ICP) could be disrupted by changes in positioning. For example, turning can effect the functioning of large bore catheters in use during ECMO and hemodialysis or compromise ventilation by leaking air around an endotracheal tube with head repositioning; Neidig observed that maintaining a turning protocol was not a nursing or medical staff priority in the post open-heart surgery period. The use of “listing” or employing a 15° or less shift in position has been recommended to counter the pressure forces.

**Oxygenation/perfusion deficits.** Oxygenation/perfusion deficits were countered with the use of mechanical ventilation and ECMO, in addition to intravenous administration of vasopressors to maintain blood pressure. The eventual amputation of both lower extremities attest to Master S’s substantial perfusion deficits. Over a period of time, the vasoconstrictive action of the vasopressors to shunt blood centrally to maintain core vital functions led to ischemic peripheral tissue injury. Extensive gangrene and the potential for the development of further overwhelming sepsis led to the decision to amputate.

**Edema.** Master S experienced edema that can occur when fluid resuscitation is necessary to correct septic shock. It is likely this excess fluid leads to tissue injury by impeding circulation and the capillary exchange of nutrients and waste products. Renal failure exacerbated the patient’s edema.

Well-known strategies to manage edema include close monitoring of laboratory values and renal function with
PRESSURE ULCERS RELATED TO HAIR BRAIDS

Figure 2a,b. The ulcer approximately 3 months after diagnosis, the patient wearing loose (not tight cornrow) braids.

on-going adjustments of fluids, electrolytes, and diuretics. The need to address intravascular volumes and reverse the anasarca was addressed through the use of albumin and diuretic infusions. Total parental nutrition was initiated to secure adequate protein stores as well as provide metabolic support. Eventually, renal failure led to the need for dialysis—acutely with hemodialysis and later with peritoneal dialysis.

Sensory perception. Alteration in sensory perception also increased Master S’s risk for pressure ulcer development. His capacity to experience sensations and respond was profoundly depressed by medications such as sedatives for comfort, paralytics used to facilitate mechanical ventilation and ECMO interventions, and pentobarbital used to treat seizures and increased ICP. The stroke and septic shock led to global functioning deficits in cognition as well as in the motor, social, and emotional domains.

Medical devices. The use of medical devices is an acknowledged risk factor for pressure ulcer development in pediatric patients.12 Devices placed on the scalp for electroencephalogram (EEG) and ICP monitoring not only further limited positioning options, but they also may have contributed to Master S’s unrelieved occipital pressure.

Length of stay. A lengthy PICU stay is associated with pressure ulcer development risk.1,6,9 Master S remained in the PICU for 52 days.

Assessment.

Instrument. The aforementioned risk factors were reflected at Master S’s admission skin assessment and completion of the Braden Q, the structured pressure ulcer risk assessment tool in use at the authors’ institution. A Braden Q score of 16 or less is predictive of risk for developing a Stage II pressure ulcer in acutely ill pediatric patients.13 In this case, the overall score on admission was 14, with subscale scores of 2 in several categories, indicating a high risk for pressure ulcer development (see Table 1).

Time frame. Completing this assessment within 6 hours of admission conforms to recommended practice based on findings reported by Curley et al’s13 multisite study of 322 PICU admissions, where 57% of the pressure ulcers were present at the first observation period on PICU day 2. In other words, most pediatric pressure ulcers develop within 24 hours following an ICU admission. Therefore, while the immediate admission focus must be on stabilizing a critically ill patient’s physiologic functions, pressure ulcer risk needs to be identified within a narrow period of time.

Care plan objectives. A skin inspection and risk assessment should occur at least daily and with changes in patient condition.14 The goal of these assessments is the formulation of an individualized pressure ulcer prevention plan. It appears from a retrospective review of Master S’s chart that the initial focus of the nursing and medical staff was on preserving vital physiologic functions. A notation on the nurses’ admission assessment tool states the patient was unable to be turned. The admitting nurse selected interventions from a checklist, and no interventions were designated relevant to subscale scores of <2 for sensory perception, nutrition, tissue perfusion, and oxygenation. The Braden Q scores on the day of the WOCN consult 33 days after admission are presented in Table 2. The subscale score for tissue perfusion and oxygenation represented the most noteworthy change, from an admission finding of extremely compromised to excellent, possibly because the bilateral below-the-knee amputations had been performed. Friction and shear were identified as problems as well. It is possible to speculate that more specific interventions might have been identified if nursing documentation was computer-based. For example, in a computer-based system, a nurse could be prompted to select certain strategies from a drop-down menu instead of the broad intervention “provide pressure relief” the nurse chose for Master S (see Table 2). Specific strategies might include foam wedge, heel
offloading by pillow or boots, or low-air-loss bed. No mention of the existence of hair braids is present on either the Braden Q or on the bedside systems assessment tool.

The case study illustrates that risk factors for pressure ulcer formation exist outside the typically identified cognitive, physiologic, and developmental domains identified in the Braden and Braden Q scales. To the authors’ knowledge, this is the first report of the potential risk this braided hairstyle might pose. In addition, although a standard hospital support surface used by Master S provided pressure redistribution, strict adherence to a repositioning schedule was not clearly evident in the nurses’ documentation. The need to redistribute pressure from both the head and body while maintaining homeostasis led the WOCN to educate PICU staff about the use of “listing”—ie, a 15° lateral turn when a “full” turn to a 30° lateral side-lying position is not medically safe.1 Pressure redistribution measures that staff might employ, such as more frequent shifts in position and/or slow, gradual turns that allow physiologic functions to stabilize,4 also were discussed. The selection and use of gel cushions, foam wedges, and/or other positioning devices this patient were reviewed with the nurses. Without the appropriate use of positioning devices, it is not unusual to observe the patient wiggle or squirm as a result of involuntary movements, restlessness, or pain, increasing the risk of a pressure-related injury.

Positioning for comfort, body alignment, and functional use of limbs are also important goals. The misconception that a specialty support surface’s rotation function could replace turning to redistribute pressure was discussed with Master S’s nurses. The potential for friction and shear to occur at the occiput when the bed’s rotation was in use was described from the perspective of increasing pressure when the forces associated with immobility and pivoting on a hard relatively weighty point (the occiput) are combined.1,4,6 The patient needs to be repositioned side-to-side including when the rotation function of the support surface is being used.

**Conclusion**

Pressure ulcer development generally is accepted to be multifactorial.6 During his critical illness, the young patient in this case study had three very important risk factors for pressure ulcer development: immobility, and deficits in both sensory perception and tissue perfusion/oxygenation.13 These risk factors were present on admission and persisted throughout his PICU stay.

Confounding known risk factors, the patient’s braids also can be considered a risk factor much like prolonged pressure

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**Table 1. The Braden Q Scale Admission Braden (Q = 14)**

<table>
<thead>
<tr>
<th>Intensity and duration of pressure</th>
<th>Mobility</th>
<th>Activity</th>
<th>Sensory Perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Completely immobile</td>
<td>2 Very limited</td>
<td>2 Slightly limited</td>
<td>2 Very limited</td>
</tr>
<tr>
<td>2 Very limited</td>
<td>2 Chairfast</td>
<td>3 Slightly limited</td>
<td>3 Slightly limited</td>
</tr>
<tr>
<td>3 Slightly limited</td>
<td>3 All patients too young to ambulate; OR, walks frequently</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 No limitation</td>
<td>4 No impairment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tolerance of the skin and supporting structure**

<table>
<thead>
<tr>
<th>Moisture</th>
<th>Friction/shear</th>
<th>Nutrition</th>
<th>Tissue perfusion and oxygenation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Constantly moist</td>
<td>1 Significant problem</td>
<td>1 Very poor</td>
<td>1 Extremely compromised</td>
</tr>
<tr>
<td>2 Very moist</td>
<td>2 Problem</td>
<td>2 Inadequate</td>
<td>2 Compromised</td>
</tr>
<tr>
<td>3 Occasionally moist</td>
<td>3 Potential problem</td>
<td>3 Adequate</td>
<td>3 Adequate</td>
</tr>
<tr>
<td>4 Rarely moist</td>
<td>4 No apparent problem</td>
<td>4 Excellent</td>
<td>4 Excellent</td>
</tr>
</tbody>
</table>

**Nurse-selected interventions for Master S**

**Incontinence skin cleansing, protection**

**Reduce friction and shear**

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from lying on a medical device might contribute to pressure ulcer development. To the authors’ knowledge, this case report is the first of its kind in the literature. It underscores the need to think holistically when assessing individual risk and to proactively intervene in a timely matter to remove potential risk factors.

Occipital pressure ulcers also can lead to permanent hair loss or scarring alopecia. Whether this hair loss will cause Master S future emotional distress is unknown. Carnevale15 believes that head protection strategies should be implemented within the first 24 hours of pediatric intensive care unit admission. A thorough skin inspection and risk assessment within 24 hours of admission are necessary steps to identifying the patient at high risk for developing pressure ulcers. The implementation of an individualized pressure ulcer prevention plan with interventions adapted to changes in the patient’s medical condition and risk is important as well to patient safety.1 This case study suggests that if a patient is admitted with braids, patient/family and nursing staff education should include discussing the importance of removing them to decrease the risk of occipital ulcers.

References