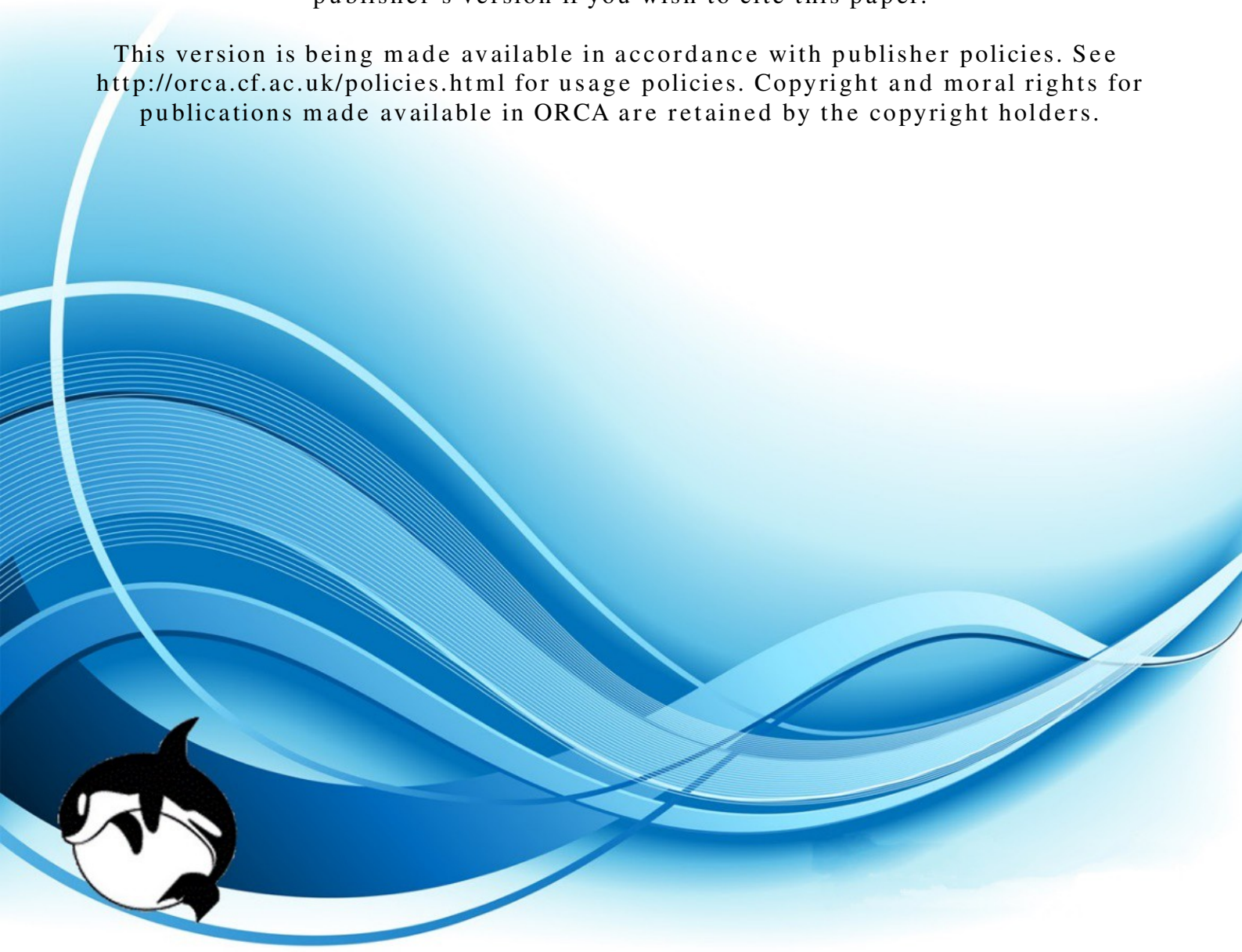

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The need for hair removal in paediatric brain tumour surgery?

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The need for hair removal in paediatric brain tumour surgery?

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Abstract

Introduction: Preoperative hair removal is conventional practice within neurosurgery in an attempt to maintain antisepsis. However, there is a lack of evidence to suggest that it makes a difference with regards to infection. This article aims to relate preoperative hair removal to SSIs for paediatric patients.

Methods and Materials: A retrospective analysis was conducted from a single paediatric neurosurgical database at the University Hospital of Wales. Patients were grouped according to whether they underwent preoperative hair removal or not. Findings were reviewed in light of the previously published literature.

Results: 182 paediatric intracranial tumours were operated on between November 2008 and 2019. A total of twenty-six patients (14%) developed an infection post-operatively, of which meningitis was the most common (77%). Eighty-nine operations were undertaken without preoperative hair removal, of which there were a total of fifteen infections (17%). In the hair removal group, there were a total of eleven infections out of ninety-three operations (12%). Overall, the patients without hair removal had a higher infection rate when compared to those with hair removal (17% and 12% respectively), however, this result was not statistically significant (p-value 0.3989).

Conclusion: We did not find evidence that hair removal in paediatric neurosurgery effects post operative infection risk.

Keywords: Neuro-oncology, Brain Tumour, Neurosurgery, Preoperative Practice.

Introduction

Preoperative hair removal is conventional practice within neurosurgery but there is a lack of evidence to suggest that it makes a difference with regards to infection rates. Several studies have even identified that shaving interferes with the natural protective barrier mechanisms of the skin and increases the risk of infection (Alexander et al. 1983; Horgan and Piatt. 1997; Ratanalert et al. 1999).

Whilst hair removal may improve visualisation of the surgical site and facilitate wound closure, there is a significant psychological impact especially for young females. There is a growing evidence base to suggest that hair removal is unnecessary in adults however the literature is limited regarding children. Paediatric neurosurgical patients have the largest

risk of surgical site infection (SSI) in comparison to other surgical procedures, particularly in those undergoing shunt procedures (Kestle et al. 2016). This article aims to determine whether preoperative hair removal is related to SSIs for paediatric tumour patients.

Materials and Methods

A retrospective analysis was conducted from a single paediatric neurosurgical database at the University Hospital of Wales. All patients undergoing brain tumour surgery were identified from November 2008 to December 2019.

New tumour patients were assigned to one of the three paediatric neurosurgeons. This was not on a rotor system but based on which surgeons were in work and available and who had access to the next appropriate theatre list. This was independent of tumour type, procedure or surgeon experience. Allocation to surgeon approximated to a random rather than regular distribution in time. The case mix between the two groups was similar. A number of patients had two consultant surgeons or trainees operating, however, the decision to shave or not remained with the responsible consultant. One of the three surgeons did not remove hair and the other two did. Other than the approach to hair removal, the surgical techniques of all surgeons were similar.

Patients were grouped according to whether they underwent preoperative hair removal or not. All surgeons were consistent with their preoperative practice throughout the ten-year period. The surgical site was cleaned with alcoholic betadine and all patients received antibiotics at the time of induction, according to local protocol. In the group without hair removal, the hair was parted along the incision line and secured by the use of sterile jelly and drapes. In the hair removal group clippers were used to remove approximately a one inch wide strip for the incision. The number of post-operative SSIs in both groups were analysed. SSIs were diagnosed using the same parameters in both groups according to local guidelines.

Statistical Analysis

For univariate analysis, data were expressed as mean +/- standard deviation. Contingency tables were used for categorical variables and, after categorization, for continuous variables. Chi-squared with Fisher's Exact Tests were determined using GraphPad Prism software (Version 6.0; 2015). All p-values were two-sided and p-values less than 0.05 were considered significant.

Results

182 paediatric intracranial tumours were operated on between November 2008 and 2019. The female to male ratio was 1:1.8 respectively. The age range of the patients was from 21 days to 17 years and 7 months. A total of twenty-six patients (14%) developed an infection post-operatively, of which meningitis was the most common (77%). Additionally, the largest group of patients developing an infection were those with a confirmed histology of Medulloblastoma (34%; see Figure 1).

Eighty-nine operations were undertaken without preoperative hair removal, of which there were a total of fifteen infections (17%). The average age of the group was 8 years and 9

months (range; 17 to 193 months). In this group, there were a total of fifteen Medulloblastoma operations, of which there were six post-operative infections (40%).

In the hair removal group, there were a total of eleven infections out of ninety-three operations (12%). The average age of the group was 6 years (range; 10 to 195 months). In this group, there were a total of seventeen Medulloblastoma operations, of which there were five post-operative infections (29%). Overall, the patients without hair removal had a higher infection rate when compared to those with hair removal (17% and 12% respectively), however, this result was not statistically significant (p-value 0.3989).

There was a total of thirty-two patients with Medulloblastoma. The average age of the Medulloblastoma group was 6 years and 7 months. In terms of these patients, the patients without hair removal had a higher infection rate when compared to those with hair removal (40% and 29% respectively), but again, this was not statistically significant (p-value 0.7120). The average age of the Medulloblastoma patients with a post-operative infection was 59 months compared to 91 months for those without infection.

Discussion

In adults, hair removal has been deemed inappropriate with regards to infection rates in all surgeries (Bekar et al. 2001; Bhatti and Leach. 2013; Braun and Ritcher. 1995; Kretschmer et al. 2000; Mackenzie. 1988; Winston. 1992). Based on this evidence, NICE guidance (2008) have advised against the use of routine hair removal, particularly with regards to recent evidence surrounding an increased risk of SSIs and shaving.

Some authors have identified that the type of hair removal method is important in terms of infection (Ratanalert et al. 1999; Zentner et al. 1987). Within neurosurgery there are two main types of hair removal: shaving and clipping. NICE guidance (2008) has identified that if hair removal is necessary, surgeons should opt to use clippers rather than shaving. This guidance is based on evidence that the use of a razor causes micro-trauma to the skin surface, altering the natural scalp flora and therefore, increasing the risk of SSI (Bekar et al. 2001; Kretschmer et al. 2000; Mackenzie 1988; Siddique et al. 1998; Winston. 1992).

A number of articles have studied this in both paediatric and adult populations (Braun and Richter. 1995; Horgan and Piatt. 1997; Ratanalert et al. 1999; Ratanalert et al. 2005; Siddique et al. 1998; Broekman et al. 2011; Zetner et al. 1987; Yeom et al. 2017). However, only three articles have focussed on paediatric patients (Tang et al. 2001; Simona et al. 2016; Piatt and Steinbok. 1994). Piatt and Steinbok (1994) first observed no significant difference in patients undergoing preoperative hair removal. Out of 172 paediatric patients (120 unshaved; 48 shaved/clipped), there was a total of one infection in the 'unshaved' group. As well as the 'unshaved' group hosting a larger population, this infection occurred in a premature infant which is a significant risk factor for infection. A further study by Tang et al. (2001) identified that there was no significant difference with respect to wound infection for a population of 90 paediatric patients (6% with and 8% without head shaving; p=0.024). Additionally, these authors observed that a younger age was an important risk factor for shunt infection, regardless of hair removal. Similar results were reported in a retrospective study by Simona et al. (2016) who reported a wound infection risk of 0.4% in patients without hair removal. These authors suggested shampoo care only is sufficient for

maintaining antisepsis whilst also improving post-operative quality of life. Our study has corroborated the findings of the previously published literature suggesting that hair removal is not necessary for reducing SSIs in children.

Limitations

We have used consultant surgeon as an instrumental variable. We consider this reasonable but there are limitations. To attribute observed differences in infection rates to hair removal requires that the instrumental variable has no effect on infection rate other than via the intermediary of hair removal. But there are possible mechanisms by which such an effect could occur such as differing surgical skill, case mix, theatres used, ward preferences, etc. We have done as much as we can to eliminate these as possible explanations but cannot do so completely.

Conclusion

Paediatric neurosurgery without hair removal is safe and does not increase the risk of infection. This may result in shortened rehabilitation periods due to the psychological implications of hair removal, particularly for young females. If hair removal is unavoidable, surgeons should opt to use clippers rather than shaving due to the increased infection risk caused by micro-trauma to the scalp.

Declaration of Interest Statement

There was no funding required for this article.

All authors declare that they have no conflicts of interest. This article is a prospective review conducted on non-identifiable patient data therefore, ethical approval was not required. All authors have complied with the specific requirements as advised by The Research Ethics Service in the United Kingdom.

Author Contributions

Data collection was performed by Alexandra Richards and Paul Leach. Statistical analysis was performed by Malik Zaben. The manuscript was written by Alexandra Richards and Paul Leach. All authors commented on previous versions. All authors read and approved the final manuscript.

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