A REAPPRAISAL OF CONTRIBUTING FACTORS LEADING TO SHUNT INFECTION

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Background: Central nervous shunt infection (CNSI) is a cause of significant morbidity, causing shunt malfunction and chronic ill health. It can also lead to prolong hospital stay. The aim of this study was to look into the factors responsible for neurosurgical shunt infection and measures to prevent them. **Method**: This retrospective case study was done with nonrandomized convenience sampling. We studied 121 patients who underwent neurosurgical shunt operations during year 1994 to 1999. These patients received pre, per and post operative antibiotics to combat shunt infection. Study design was retrospective case study with non randomized convenience sampling. **Result**: Out of 121 patients, 65 patients were females and 56 males. The total number of shunts procedures performed in these patients was 151. Ninety-seven patients operated once for shunt procedure. Eighty-three (83) patients underwent ventriculo-peritoneal shunt, 10 patients underwent lumbo-peritoneal shunt, 3 had ventriculo-pleural shunt and 1 had ventriculo-atrial shunting done. Three patients developed shunt infection, only one had true primary infection. All were adults with male to female ratio of 2 to 1 and in all of them shunt was inserted first time. **Conclusion**: Strict aseptic technique and prophylactic use of antibiotics have critical role in the prevention of shunt infections.

Keywords: CNSI, shunt infection, aseptic technique, and prophylactic antibiotics

INTRODUCTION

Central nervous shunt infection (CNSI) is a cause of significant morbidity, causing shunt malfunction and chronic ill health. It can also lead to prolong hospital stay, 3 times more operative procedures than the non infected cases and have twice the fatality rate[1], with a reported incidence varying from 3.3%[2,3] to 23%.[4] Although by the use of aseptic surgical techniques very low rates (0.4%) have been reported by Choux and colleqgues.[5] In shunt infections frequency of pathogens as well as antibiotic sensitivity pattern aiming at suitable prophylaxis is necessary.[6] When patients present with smouldering fever, progressive disturbed consciousness, seizures, or abdominal fullness after ventriculoperitoneal shunt procedures CNSI should be suspected. Fever and progressive disturbance of consciousness are most common clinical features in adult patient group, where as disturbance of consciousness and abdominal symptoms and signs are the two most common clinical features in paediatric patient group.[7] Approximately 10% of cerebrospinal fluid (CSF) shunt infection are associated with infection and require removal or externalization of the shunt, in hospital treatment with antibiotics and insertion of new shunt.[8] In this study we reviewed the frequency of CSF shunt infections in our practice and tried to identify the contributing factors.

PATIENTS AND METHOD

We looked into One Hundred and Twenty-One (121) patient notes that underwent different CSF shunt operations between years 1994 to 1999. Types of procedures done to control CSF pressure were dependent on the age, and type of presentation of patient. Ventriculoperitoneal, ventriculoatrial, ventriculopleural and lumboperitoneal shunt procedures were performed. This retrospective case study was done with nonrandomized convenience sampling. Patients' data were collected by reviewing patients' files from hospital central medical record section. Follow-up was done in post operative hospital stay and in clinic for any signs and symptoms of shunt infection. All these patients received pre-, per-, and post-operative antibiotics. Choice of antibiotics was third generation cephalosporin.

RESULTS

Out of the one hundred and twenty-one (121) patients fifty-six (56) were male and sixty-five (65) were female. Age ranged from less than 1 month to 83 years. Mean age was 35.1 year. Ten (10) patients were less than 6 months of age. Total one hundred and fifty-one (151) shunt procedures were performed in these patients. Demographic characteristics and surgical outcome are given in Table-1.

Table-1: Demographic characteristics and surgical outcome of patients

Variable	Number	Percentage
Gender (n=121)		
Male	56	46.28
Female	65	53.71
Mean age of total subjects: 35.1 years		
Operating surgeon (n=151)		
Surgeon himself	69	45.69
Surgical resident	82	54.30
Type of shunts (new) (n=97)		
Ventriculoperitoneal	83	85.57
Lumboperitoneal	10	10.30
Ventriculopleural	3	3.09
Ventriculoatrial	1	1.03
Type of shunt (revision of shunt) (n=54)		
Ventriculoperitoneal	51	94.4
Lumboperitoneal	2	3.7
Ventriculopleural	1	1.9
Complications (n=151)		
Primary infection	1	0.66
Secondary infection due to ruptured appendix and colon	2	1.32
Complications (in gender) (n=3)		
Male infected	2	1.32
Female infected	1	0.66
Pathogens (n=3)		
Staphylococcus epidermidis	1	33.33
Gram negatives	2	66.67

DISCUSSION

Central nervous shunts are used for the intracranial pressure management and temporary cerebrospinal fluid drainage. Infection of shunts is a major cause of morbidity and mortality in patients with CSF shunts. Various studies are conducted to evaluate the clinical features, pathogens, and outcomes of CNSI shunt infections.[9] In patients with cerebrospinal fluid (CSF) shunt infection, removal of the shunt and antibiotic administration is the current standard of care.[10] Approximately 10% of CSF shunt operations are associated with infection require removal or externalization of shunt, in hospital treatment with antibiotic agents, and insertion of new shunt.[8] Although some infections have been managed successfully with antimicrobial therapy alone, the timely use of appropriate antibiotics according to antimicrobial susceptibility testing and removal of shunt apparatus are essential for successful treatment.[7]

In our study we included patients in age ranged from 1 month to 83 years of age, who underwent shunt procedure for hydrocephalus. Total 121 patients underwent shunt infection and only 3 developed shunt infection. We also looked into surgeon rank and found that 69 of shunt procedures were performed by consultants and the rest 82 by the trainees. We also considered time factor and found that the duration of surgery ranged from 30 to 180 minutes. The variation in time taken by different surgeon was due to surgeon's own skills and experience and also time taken for shunt revision. The total number of infected cases were only 3 (2 male and 1 female), however among these 3, only 1 was truly infected, which was due to staphylococcus epidermidis, while the remaining two was due to primary infection in abdomen due to perforated colon and ruptured appendix.

The study was conducted primarily to evaluate importance of different factors contributing to the development of shunt infections. In an early study by Mollman *et at*[11] the incidence of shunt infection was high (5 to 20%) in the presence of factors such as young age of the patient, operation performed by the junior registrar, longer duration of operation and in shunt revision. However our study did not find any correlation between these factors and the incidence of shunt infection. What we concluded in our study is the lower incidence rate (0.7%) of shunt infection. This is by the use of strict aseptic technique and the prophylactic use of antibiotics. The benefit of strict aseptic technique had also been confirmed by Choux and colleagues[11] and the efficacy of prophylactic use of antibiotics was reported in an early study by Z. Kinderchir *et al*, who showed 3.27% times greater risk of infection in those who did not receive antibiotics than those who did.[2] While discussing the timely management of shunt infections, different modalities should be kept in mind to control pathogens and to prevent devastating sequelae.

CONCLUSION

Our study highlighted the importance of strict aseptic surgical technique by senior surgeon in counted operation time, considering the pre operative general health of the patient and timely use of correct prophylactic antibiotic is vital to prevent central nervous shunt infection. If infection develops better choice of antibiotic depending on antimicrobial susceptibility testing achieves timely cure.

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