



## THE PERIOPERATIVE USE OF CEFTRIAOXONE AS INFECTION PROPHYLAXIS IN NEUROSURGERY: CRANIOPLASTY

Amer Hayat Khan\*<sup>1</sup>, Andee Dzulkarnaen Zakaria<sup>2</sup>, Syed Azhar Syed Sulaiman<sup>1</sup>, Muhammad Ihtisham Umar<sup>1</sup>, Nur-Elyana Yazmin Redhuan<sup>1</sup>

<sup>1</sup>School of Pharmaceutical Sciences Universiti Sains Malaysia, 11800 Penang, Malaysia

<sup>2</sup>Department of Surgery, School of Medical Sciences, Universiti Sains Malaysia, Health Campus, Kelantan, Malaysia

\*Email: amerhayat@ymail.com

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### ABSTRACT

Prophylactic use of antibiotics applied peri or intraoperatively is commonly adopted in many hospitals to decrease the incidence of postoperative infections following surgery, including neurosurgery. We report a case of a 20 years old young female who undergone cranioplasty. A year earlier, the subject underwent removal of bone flap after a motor-vehicle-accident. It resulted into the development of a sinking skin flap, insisting a cranioplasty immediately after 6 months that was delayed, however, for one year. The patient was given a course of antibiotic prophylaxis of IV Ceftriaxone 2gram stat pre-surgery and continued with IV Ceftriaxone 1 gram for another 2 doses. No infection was developed in the subject several days after the surgical procedure, proving it to be successful. The current case study encouraged the prophylactic use of antibiotics to prevent sepsis or infections associated with cranial surgeries.

**Keywords:** Cranioplasty; Ceftriaxone; Infection; Perioperative; Prophylaxis

### INTRODUCTION

A surgery is one of the most stressful procedures a patient could undergo. There are numerous types of surgeries. For instance, a neurosurgery can either be a craniectomy (removing a part of the skull), a craniotomy (visualizing and gaining access to a structure within the cranium) or a cranioplasty (repairing a cranial defect). According to William and colleagues, there has always been a high risk of infections associated with surgical procedures, doubting the overall success of the otherwise carefully performed surgeries.<sup>1</sup> Thus, the use of prophylactic antimicrobial drugs, before and during surgical procedures, becomes imperative to reduce infection possibility. The protective efficacy of prophylaxis in clean and contaminated neurosurgical procedures ranges between 63 and 76 percent.<sup>2</sup> The average incidences of infections in clean neurosurgical procedure are varying from 3 to 4 percent, and prevention of infectious complications is far more practical than treating them.<sup>2</sup>

#### Case Presentation

A 20 years old female was admitted to Hospital Universiti Sains Malaysia (HUSM) for elective cranioplasty. A year prior to admission, she sustained an epidural hematoma from a motor-vehicle-accident and had undergone a craniectomy. Bearing a severe conditions with a Glasgow Coma Scale (GCS) score of 6, the patient had a follow up with the neurologist for last 6 months. Cranioplasty was declared to be mandatory for the patient by her doctor and was scheduled to undergo the surgery.

On the day of admission, her vital signs were good, her GCS score was 15/15 and she had no other medical illness. Although apparently normal in household work, the patient was not as much active as she was before the accident, indicating a consistent underlying illness. She was not taking any other medication prior to admission and was only allergic to seafood. She was given a premedication; one dose of 7.5mg of Tablet Midazolam and an intravenous injection of Ceftriaxone 2g stat for prophylaxis 1 hour prior to surgery. During the procedure, it was found that the scalp over the defect was indented. The previous bifrontal incision was then

reopened. Her bone which was preserved was then fixed to the skull back with 4 sets of craniofix. Culture and sensitivity swab was taken for analysis prior to surgery. Redivac was inserted for drainage and the wound was then closed and dressed.

The patient was then extubate and the GCS was monitored hourly until the patient became fully conscious. The intravenous drip continued until the patient could take the medication orally. The wound was inspected on day 3 and the stitches were removed on day 7. The Redivac was kept fully functional for 24 to 48 hours post surgery before it was removed. The surgery was successful and there was no complication reported.

#### Medications of post-surgery:

1. IV Ceftriaxone 1g BD (for another 2 doses)
2. IV Tramadol 50 mg QID (For one week)

#### Medications for discharged:

1. C. Cloxacillin 500mg QID
2. T. Paracetamol 1g QID
3. Celecoxib 200mg BD

### DISCUSSION

Postoperative infection following neurosurgery is a serious complication which may be life threatening. It can occur in superficial tissues such as skin surrounding the wound, bone-flap or in the deeper tissues resulting in meningitis, encephalitis and brain abscess.<sup>3</sup> It is known that Gram positive *Staphylococci* are the most common causative pathogens for postoperative infections in neurosurgery due to the contamination from the skin. This comes to the need for surgical prophylaxis to prevent the postoperative infection especially in clean operative procedures.<sup>3</sup>

Prophylactic use of antibiotics applied peri or intraoperatively is commonly adopted in many hospitals to decrease the incidence of postoperative infections following surgery, including neurosurgery.<sup>4</sup> The patient was given 2 gram stat dose of IV Ceftriaxone as prophylactic agent followed by another 2 doses postoperatively. It has been suggested that an ideal antibiotic regimen for prophylaxis not only should have effectiveness with the lowest possible risk of adverse

reactions, but also have convenience of administration and cost-effectiveness, recommending a single-dose administration in many types of surgery.<sup>5</sup>

Ceftriaxone is a 3rd generation cephalosporin with a long half-life of approximately about 8 hours. As it reaches its therapeutic concentration, it exhibits a very good penetration into many tissues and able to cross the blood-brain barrier even though the meninges are not inflamed. Its concentration in the CSF is 10-1000 times higher than the MICs for the majority of potential meningitis pathogens even 24 h after the administration of a single dose of approximately 50 mg/kg body weight.<sup>6</sup> Therefore, perioperative administration of this antibiotic shortly prior to neurosurgery has been suggested as an effective agent for postoperative infection prophylaxis.<sup>7</sup> However, there are no published studies involving a substantial number of patients in the literature.

Even though there is a very low incidence of infection in clean neurosurgical procedures, which averages 3 to 4 percent, prevention of infectious complications is far more practical than treating them once they have become established.<sup>4</sup> In a randomized, controlled trial of antibiotic prophylaxis in neurosurgery which involves 407 patients done by Geraghty and Feely (1984) had shown that there is significant benefit from antibiotic prophylaxis.<sup>6</sup> This is true in this particular case, which there is no post-surgery

complication of infection and the surgery was considered a success.

#### CONCLUSION

Antibiotic prophylaxis significantly reduces the risk of surgical site infection or sepsis in clean cranial surgeries. Further studies are recommended to determine the optimum dose of antibiotic prophylaxis with assessment comparison of the effectiveness of different antibiotics.

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