

## Progress

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Title of Project: BEST TBI: Bactericidal External Ventricular drains in paTients with Traumatic Brain Injury

### *Summary:*

External ventricular drain (EVD) catheters are integral to the management of treating patients with head trauma, subarachnoid haemorrhage and other neurosurgical conditions that necessitate cerebro-spinal fluid (CSF) diversion. However, as with all interventions the possible benefits must be weighed against the possible complications of the intervention. A common and potentially devastating complication of an EVD insertion is catheter infection leading to ventriculitis and meningitis. Infection rates ranging from 3.4%-21.9% have been reported<sup>1-7</sup>. These infections appear to stem from microorganism colonization of the EVD catheter. Development of ventriculitis not only has the potential to cause significant morbidity (with poor functional outcome), but also significantly raises the cost of health care for these patients, as a consequence of increased lengths of intensive care unit (ICU) and hospital stays, ongoing antibiotics and additional medical interventions<sup>13,14</sup>.

In order to overcome this problem of bacterial colonization and subsequent infection, EVD and shunt catheters, which have been impregnated with antibiotics, have been used with varying degrees of success. A recent meta- and economic analysis focusing on the use of antibiotic impregnated shunts in a mixed population of paediatric and adult patients, found a significant reduction in infections when using these systems with an associated cost saving<sup>18</sup>. These catheters are significantly more expensive than standard catheters. To date, a number of studies have looked into the effect of using antibiotic impregnated catheters on EVD infection rates. An initial study which obtained data from 288 patients found that rifampicin and minocycline impregnated catheters were half as likely to be colonized as non-impregnated catheters and more importantly, the authors reported that CSF positive cultures were 7 times less frequent when using antibiotic catheters (1.3 vs 9.4%,  $p=0.002$ )<sup>8</sup>. However, less than 20% of these enrolled patients were trauma patients.

Another contemporary study, from New Zealand, compared infection rates in 60 patients with clindamycin and rifampicin impregnated catheters with 60 historical controls. The results suggested that impregnated catheters reduced the risk of ventriculitis (defined as positive CSF culture or raised WCC count) from 15% to 5% and CSF positive results dropped from 6.6%

to 1.3%<sup>9</sup>. However, the indications for the insertion of the EVD were not provided<sup>9</sup>. Recently a large international, prospective, randomized trial found that of an initial sample size of 434 patients, 176 received an impregnated catheter and 181 a standard catheter<sup>10</sup>. This trial failed to find a significant benefit to the use of antibiotic impregnated catheter with a 2.3% for impregnated catheters compared to a 2.8% infection rate (positive CSF gram stain and culture) for standard catheters<sup>10</sup>. Suspected infection rate (positive CSF culture but negative gram stain or leucocytosis) was 17.6% versus 20.4% and again was not significant. Unfortunately this study did not provide any information of whether any of the patients had suffered a traumatic head injury<sup>10</sup>.

### *Hypothesis vs Findings*

To summarise the contemporary literature, the role of antibiotic impregnated catheters remains unsettled; in particular, the trauma setting is underrepresented within these studies. In our experience patients suffering traumatic head injuries often suffer multiple injuries in addition to their head injury and often require prolonged stays in ICU. It is in this cohort of patients that impregnated catheters might be most useful, as we suspect the altered physiological conditions and presence of concomitant (often contaminated) injuries enhance the global risk of catheter infection beyond that of other patient cohorts requiring EVD insertion.

### *Unanswered Questions*

Currently it is not known whether Antibiotic impregnated catheters reduce infections and the complications associated with infection, particularly in the traumatic head injury cohort. Our multicentre randomised control trial aims to address this question specifically.

Currently we have recruited 77 patients to our study. We also have centres operating in Canberra and Perth in addition to Melbourne.

We estimate that recruitment should be complete within 12-18 months.

### *What these research outcomes mean*

The findings will provide crucial medical data, which will be used in treating traumatic head injuries (both nationally and internationally) and will also provide health-economic data into the cost effectiveness of using antibiotic impregnated catheters in trauma patients.

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