

Comparative dural closure techniques: A safety study in rats.

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Abstract:

Background: Some neurosurgical procedures have high morbidity and mortality rates due to cerebrospinal fluid (CSF) fistula development, particularly when dural defects are in relatively inaccessible areas or surrounded by friable dura. We used a rat model to test 4 different dural closure techniques to determine which one was significantly superior for achieving a watertight dural closure with minimal harm to brain tissue. Methods: The rats were randomly divided into 2 groups. The first group (group A, n = 40) was used to test the strength of the adhesivity for CSF leakage. Histopathologic studies were used to evaluate the granulation tissue between the dura and dural graft. Effects on the brain tissue were studied in the second group (group B, n = 40) where lipid peroxidation was determined. These 2 groups consisted of 5 subgroups: control, methyl metacrylate, n-butyl cyanoacrylate, fibrin glue, and CO₂ laser. Results: Methyl metacrylate and CO₂ laser techniques were inadequate for stopping dural leakage and had harmful effects on brain tissue. Cerebrospinal fluid leak was observed only in 1 rat in the n-butyl cyanoacrylate subgroup and this result was statistically significant (P = .0005), but lipid peroxidation levels for this material showed that it was not safe for dural closure in case it leaked through the dural defect. The lipid peroxidation levels of the fibrin glue subgroup were not statistically significantly different from the control group (P = .440). Conclusions: Fibrin glue was the safest material with a CSF leakage risk that was higher than n-butyl cyanoacrylate (25% vs 12.5%) but acceptable. This study showed no relationship between the CSF leak and histopathologic findings for sealant properties of the tissue adhesives. © 2006 Elsevier Inc. All rights reserved.