

Use of an Expanded Polytetrafluoroethylene (ePTFE) Dura Substitute in Glioma Surgeries: A Technical Note

Uso do substituto dural politetrafluoroetileno expandido (ePTFE) em cirurgias de gliomas: Uma nota técnica

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Abstract

Introduction Reoperations are a common scenario among glioma patients. There is crescent evidence of its benefit in low- and high-grade gliomas. Here we discuss our experience with inert expanded polytetrafluoroethylene (ePTFE) dura substitute in glioma surgeries.

Technical note We generally put the ePTFE dura substitute below the dura of the patient, even if it is intact. This membrane should be sutured in place using a tension-free technique, with 4-0 polypropylene. Expanded polytetrafluoroethylene minimizes tissue attachment and fibrosis when performing reoperation in glioma patients.

Discussion Since the literature has shown benefits in survival with reoperation in glioma patients, the use of ePTFE dura substitute can improve surgical time and minimize complications in a second surgery.

Keywords

- reoperation
- glioma
- dura substitute
- surgical complication

Resumo

Introdução Reoperações são comuns entre pacientes portadores de glioma, com crescente evidência de seu benefício em casos de baixo e alto graus. Aqui discutimos nossa experiência com o substituto dural politetrafluoroetileno expandido (ePTFE) em cirurgias de glioma.

Nota técnica Geralmente colocamos o substituto dural ePTFE abaixo da dura-máter do paciente, mesmo quando intacta. Essa membrana deve ser suturada sem tensão com fio prolene 4.0. ePTFE minimiza aderência tecidual e fibrose, facilitando as reoperações em pacientes com glioma.

Palavras-chave

- reoperação
- glioma
- substituto dural
- complicações cirúrgicas

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Introduction

Reoperations for recurrent low-grade gliomas (LGG) should be the standard of care.¹ Concerning high-grade gliomas (HGG), reoperation remains controversial, given the limited life expectancy and the aggressive/recurrent nature of these tumors, but there is crescent evidence of benefits with this treatment strategy.² Recent studies have shown that a second operation improves survival in patients with glioblastoma multiforme (GBM), with surgical complication rates similar to single-surgery patients.^{3,4}

Reopening the dura mater and releasing it from the cerebral cortex in a glioma reoperation can be difficult and increase the surgical time; besides, it may cause cortical injury. Due to the important role of reoperation in glioma patients, here we discuss our experience with inert expanded polytetrafluoroethylene (ePTFE) dura substitute in glioma surgeries to minimize the difficulties of reoperation.

Technical Note

When planning surgery in patients with suspected gliomas in magnetic resonance imaging (MRI) studies, we routinely use an ePTFE dura substitute. After lesion resection and hemostasis of the tumor bed, we put the membrane below the dura of the patient, even if it was intact, as shown in ►Fig. 1. The ePTFE dura substitute should be sutured in place using a tension-free technique. This can be achieved by appropriately sizing the membrane to slightly overlap the dural defect and putting minimal tension on the sutures (►Fig. 2). This may avoid unnecessary needle punctures in the material. The substitute is compatible with any nonabsorbable suture with a noncutting needle, such as a taper or piercing point. We used 4-0 polypropylene in all of the cases.

As shown in ►Figs. 3 and 4, ePTFE minimizes tissue attachment and fibrosis when performing reoperation in glioma patients, lowering the surgery time and complications.



Fig. 1 Expanded polytetrafluoroethylene dura positioning bellow the dura mater of the patient.

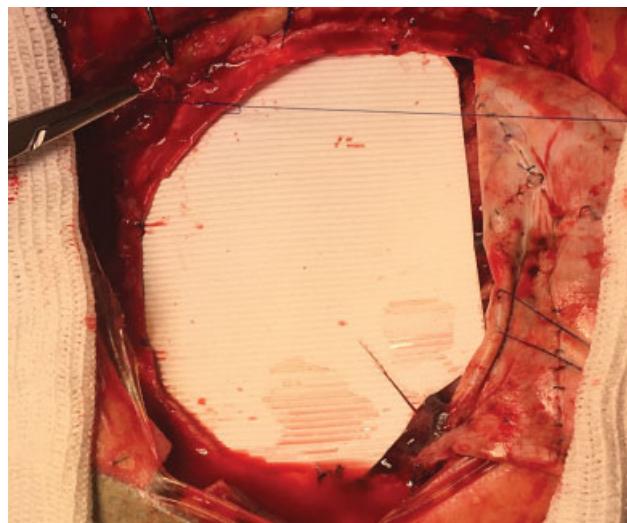


Fig. 2 Expanded polytetrafluoroethylene dura substitute sutured in place with a tension-free technique.

Discussion

Low-grade glioma is a chronic disease of the brain, and should be treated with a personalized and long-term multi-stage therapeutic approach.⁵ The importance of surgery and maximal extent of resection (EOR) is well-established in primary LGG management. There is increasing evidence to support maximal EOR for treating recurrent LGG as well, as it may improve progression free survival (PFS) after recurrence and overall survival (OS).¹ Reoperations of the patients with recurrent LGG have similar risk of neurological complications and sequelae when compared with the initial surgery.⁶

Regarding HGG, Lacroix et al have shown that the EOR improves survival.⁷ Predictive factors of good prognosis after a second surgery include young age, high Karnofsky performance status (KPS) score, gross total resection, and longer time interval between operations.⁸⁻¹¹ D'Amico et al showed recently a greater total survival in patients > 65 years old submitted to a second intervention than those submitted to a single surgery.³ Moreover, systemic, local, or neurological complication rates were not significantly different between the single-surgery group and the reoperation group in that study.³ Chen et al showed similar results and concluded that, in a select group of patients with recurrent grade IV glioblastomas, repeated craniotomy had a significant survival benefit without severely compromising functionality.¹²

The ePTFE dura substitute is indicated for use as prosthesis for the repair of the dura mater during neurosurgery. It has a porosity of < 1 μ, which provides excellent conformability and handling while minimizing fibrous tissue ingrowth. This dura substitute serves as an inert, watertight, full thickness dural graft that minimizes tissue attachment between the neural structures and other tissues.¹³ Another advantage is that it becomes translucent after 3 to 4 months *in vivo*, which allows visualization of the underlying neural structures in reoperations.¹⁴

Besides avoiding tissue attachment and fibrosis in reoperation, we did not observe cerebrospinal fluid fistula or meningitis in patients with ePTFE dura substitute. This

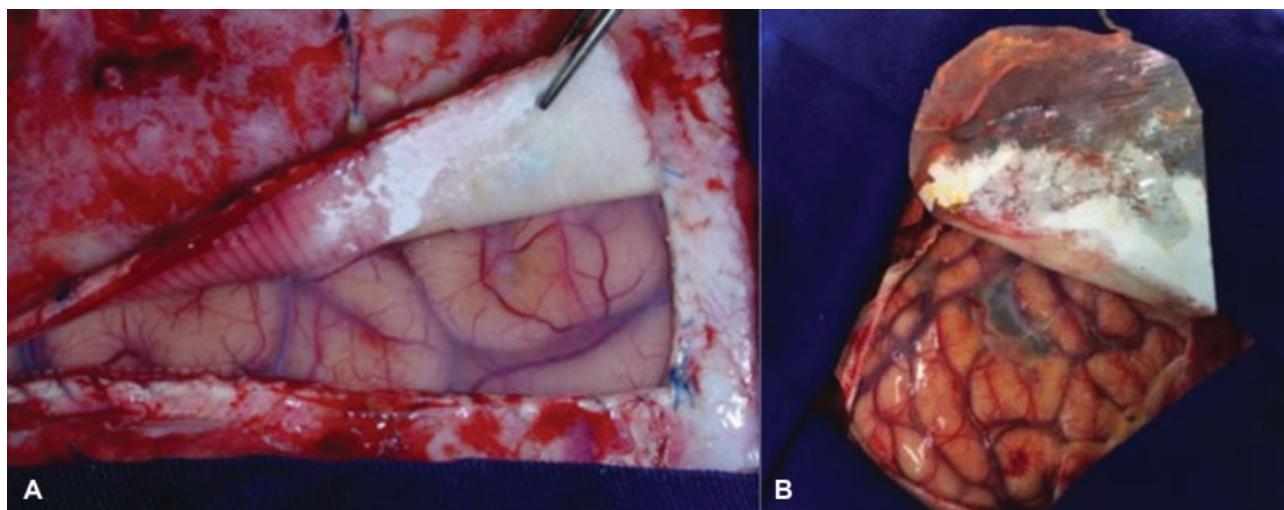


Fig. 3 Brain aspect underneath expanded polytetrafluoroethylene dura.

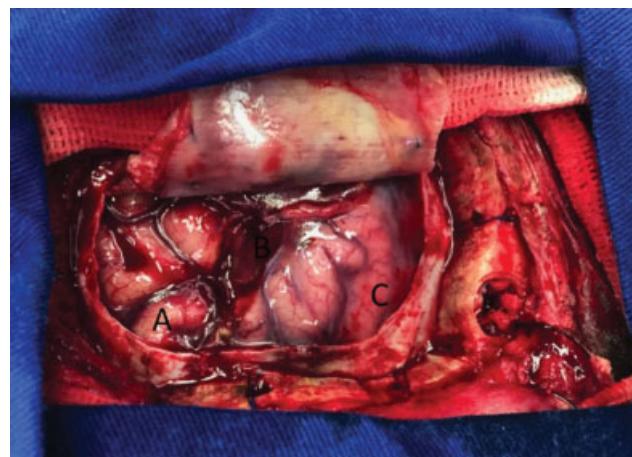


Fig. 4 Comparison of brain surface with and without expanded polytetrafluoroethylene dura substitute in reoperations in a glioblastoma multiforme patient. Tissue attachment and blood vein lesions can be seen in the area with no dura substitute (A), in opposite of preserved anatomy with no fibrosis in tissue covered by expanded polytetrafluoroethylene membrane (C). Between both, previous tumor cavity (B).

membrane has already been shown to be a safe and effective synthetic dura, without the complications observed with other synthetic and biological materials.^{15–18}

Conflicts of Interests

The authors have no conflicts of interests to declare.

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