Inflammatory Reaction After Cranioplasty Using Bovine Pericardium as a Dural Substitute

RESUMO

Enxertos substituindo dura-máter são comumente aplicados em Neurocirurgia. O pericárdio bovino é considerado seguro e associado a raras complicações. Objetivamos mostrar caso de uma paciente com meningeoma do tubérculo selar, que apresentou uma complicação atípica após duroplastia utilizando pericárdio bovino para reconstrução da região fronto-temporal. Após dois dias de boa evolução pós-operatória, a paciente apresentou piora neurológica e a TC de crânio evidenciou hematoma intraparenquimatoso à direita, com edema peri-lesional, sendo necessária cirurgia para drenagem, e substituição do pericárdio bovino por enxerto de fáscia lata, com boa evolução pós-operatória. Pericránio pediculado, fácscia temporal e fáscia lata constituem as mais efetivas e seguras escolhas para substituir dura-máter. Dentre os enxertos heterólogos e sintéticos utilizados, o pericárdio bovino é associado a poucas complicações. Todavia, intercorrências como reação inflamatória e infecção tem sido descritas relacionadas à substância glutaraldeído, presente neste enxerto.

Palavras-chave: glutaraldeído, substituto dural, reação adversa, pericárdio bovino.

ABSTRACT

Dura mater grafts are commonly applied in neurosurgery. The bovine pericardium is safe and associated with rare complications. We report a case of a patient presenting with tuberculum sellae meningioma and unusual complication after frontotemporal duroplasty using bovine pericardium. After two days of good postoperative evolution, the patient presents with neurological worsening and CT scan shows intraparenchymal hematoma on the right, with perilesional edema, requiring surgery to drain and replace the pericardium of a fascia lata graft, with good postoperative evolution. Pediculated pericranium, temporal fascia and fascia lata are the most effective and safe choice to replace the dura mater. Among heterologous grafts, bovine pericardium is associated with few complications. However, complications such as inflammation and infection are related to the substance glutaraldehyde, present in such graft.

Key words: glutaraldehyde, dural substitute, adverse reaction, bovine pericardium.
Dural substitutes are used in neurosurgery when a primary closure of the dura remains difficult or impossible in order to avoid cerebrospinal fluid leakage. Dural substitution is often necessary, using auto grafts or synthetic grafts. Auto grafts from muscle or fascia are the most effective and safe but are not always available in the desired quantity and shape. Therefore, the use of synthetic grafts may be required.

One of the most used agents for dural allograft is bovine pericardium, which is considered safe and is associated with few complications.

The aim of this report is to present a case of a 62-years-old woman who had an atypical complication after duroplasty using bovine pericardium, and review some epidemiological, pathophysiological, clinical and prognostic topics.

A 62-year old woman, with a clinical history of diabetes and arterial hypertension, was referred for pain and visual loss for approximately 1 year. Cranial computed tomography (CT) and brain magnetic resonance imaging (MRI) evidenced a small tuberculum sellae meningioma. During the right supraorbital approach, it was observed that dura was strongly attached to the inner bone layer, associated with dural fragility, leading to an extensive frontotemporal dural laceration, in spite of all technical efforts to avoid such damage. A pericranium autograph was used to reconstitute the dura of the sphenoidal and sellar region. However, due to the extensive dural defect, pericranium and bovine pericardium graft were used at the right fronto-temporal area. The patient had a good immediate postoperative evolution. In the third day, she presented with sensory impairment and left hemiparesis. Cranial CT presented intracranial bleeding - a right frontal hemorrhagic collection with intense perilesional edema - and midline shift. (Fig. 1) She was submitted to drainage of the hematoma and the bovine pericardium was removed, with substitution of the dural plastic for an autologous fascia lata graft. Postoperative course was satisfactory in the first two days, with impairment of consciousness and left hemiparesis in the third day. CT showed intense vasogenic edema on the right frontal lobe with midline shift. On the basis of such findings, she was submitted to an internal decompressive aspiration of the friable cerebral tissue of the right frontal lobe. Pathology analysis showed a cerebritis process (Fig.2). Bacterial studies had negative cultures. The patient evolved with neurological improvement and after a six-week antibiotic treatment, she had complete neurologic recovery and normal cognitive function.

Figure 1. CT (axial cut) - Right frontal hemorrhagic collection with intense perilesional edema and midline shift.

Figure 2. AP examination: Limphocytic perivascular proliferation.
Most authors agree that the ideal dural substitute must be inert, non-toxic, noncarcinogenic, impermeable to liquids, able to hold sutures, prevent meningeval adhesions or infections, easily handled and sterilized, and finally inexpensive. Vascularized pericranium, temporal fascia and fascia lata, are the most effective and safe choice to replace dura mater, but are not always available in the desired quantity and shape. In such cases, heterologus and synthetic grafts are used.

Bovine pericardium is a widely used agent for dural allograft and is associated with few complications. This heterologous graft can be easily prepared and is relatively low-price.

In the present case, the patient lost an extensive area of the frontotemporal dura during the approach. After tumor resection, pericranium and bovine pericardium graft were used as dural substitute.

The patch of bovine pericardium used comprised of bovine pericardium pretreated in purified and buffered 0.5% glutaraldehyde. Such chemical treatment promotes adequate characteristics of strength, flexibility and absence of antigenicity.

Bovine pericardium has been used with safety for years. A study of 32 patients, which used bovine pericardium prepared without glutaraldehyde for dural substitution, showed no complications. A comparative study using lyophilized human dura and lyophilized bovine pericardium demonstrated equally low rates of immune response in both. Another published study, reporting clinical outcomes and complications after bovine pericardium use as dural substitute, demonstrated excellent results.

A case control study described complications like inflammatory reaction and bigger rates of infection related to a biological glue made with 10% of Glutaraldehyde. Such findings suggest that the substance could be involved in the inflammatory response observed in the present case.

Glutaraldehyde is a chemical substance frequently used as a disinfectant and sterilizing agent against bacteria and viruses (2% solution), an embalming fluid and tissue fixative, a component of leather tanning solutions, and an intermediate in the production of certain sealants, resins, dyes, and electrical products. This substance is related with some inflammatory reactions like asthma and dermatitis. Fust et al. proved in vitro cytotoxicity of this substance and also necrosis, edema and high grade inflammation observed in lung and liver tissue in vivo. Studies showed that glutaraldehyde can initiate an immediate acute phase inflammatory reaction, leading to an inflammatory chronic granulomatous tissue, and creating a possible aseptic suppurative environment, where bacterial could grow.

In order to minimize the risk of cerebral reaction and infection, bovine pericardium should be washed with saline solution to remove all the glutaraldehyde and other chemical substances. In spite of such efforts, the present patient presented a serious inflammatory reaction.

**REFERENCES**


**CONCLUSION**

Bovine pericardium usually is a safe graft for dural repair. Extensive washing before application is recommended in order to avoid inflammatory reaction and infection. Autologous grafts are the first and best choice for dural reconstruction.