Dural substitute

A dura mater graft is a surgical procedure where a graft is utilized to repair or reinforce the dura mater, which is the tough outermost membrane surrounding the brain and spinal cord. The dura mater serves to protect the central nervous system and provide support.

Here's an overview of how a dura mater graft procedure typically works:

Indication: Dura mater grafts are commonly used in neurosurgery when there is damage to the dura mater due to injury, surgery, or disease. This damage can lead to cerebrospinal fluid leaks, which can result in complications such as meningitis or intracranial hypotension.

Graft Selection: The graft material can vary depending on the specific needs of the patient and the surgeon's preference. Common graft materials include synthetic materials like Gore-Tex or collagen-based matrices, as well as biological materials such as autologous (from the patient's own body) or allogeneic (from a donor) dura mater.

Preparation: If using a biological graft, it is typically harvested from a donor cadaver. The graft is processed and sterilized to remove any potential contaminants while preserving its structural integrity.

Surgical Procedure: During the surgical procedure, the damaged or weakened portion of the dura mater is identified and carefully repaired. If necessary, the graft material is trimmed to fit the defect and sutured or otherwise secured into place over the damaged area. The goal is to create a watertight seal to prevent cerebrospinal fluid leakage.

Postoperative Care: After the procedure, patients are typically monitored closely for any signs of complications, such as infection or recurrence of cerebrospinal fluid leakage. Depending on the extent of the surgery and the patient's overall condition, recovery times can vary.

Dura mater graft procedures are essential in neurosurgery for restoring the integrity of the dura mater and preventing complications associated with cerebrospinal fluid leaks. The choice of graft material and surgical technique depends on various factors, including the patient's medical history, the extent of the dural defect, and the surgeon's expertise.

Since the 1890s, several materials have been used as dural substitutes. At this point, the most commonly used substitutes are autologous grafts, e.g. fascia lata and galea-pericranium, or synthetic meshes. The synthetic meshes can be either absorbable or non-absorbable.

The standard methods of dura mater repair consist of the application of sealants and the use of dura mater replacement materials (duraplasty) to expand or replace the resected dura mater during a neurosurgical procedure.

Dural substitutes are used as patches to prevent CSF leakage and infection and foster regrowth of dura-like tissue across the defect. Native autologous tissue grafts, such as the fascia lata, temporal fascia, and pericranium, can perform well as dural substitutes because they do not provoke severe inflammatory or immunological reactions, but potential drawbacks, such as difficulty in achieving a watertight closure, formation of scar tissue, insufficiently accessible graft materials to close large dural defects, and additional incisions for harvesting the graft, remain problematic.

Off-the-shelf dural substitutes have been developed as alternatives to autologous transplantation and various xenografts have been studied, including bovine and ovine pericardium, porcine small intestinal submucosa, and processed collagen matrices. However, these xenografts are often associated with adverse effects, such as graft dissolution, encapsulation, foreign body reaction, scarring, and adhesion formation. Permanent and bioresorbable synthetic polymer membranes have also been tested as dural substitutes.

Although many efforts have been made, the challenge to develop a suitable dural substitute has been met with limited success.

Several types of dural substitute materials have recently been discarded or modified owing to poor biocompatibility or mechanical properties and adverse reactions.

Numerous natural and synthetic substitutes have been proposed for dural grafting. Autografts, allografts, xenografts and nonabsorbable or absorbable polymer sheets have been used in experimental models and clinical practice [1].

see Biomimetic composite substitute.

Bovine tissues are now routinely used for dural closure in cranial and spinal surgery.

see Collagen matrix dural substitute.

Cerafix.

DURAFORM.

DuraGen

DuraMatrix.

Fascia lata.

GORE® PRECLUDE® PDX

Lyoplant.

Neuro-Patch.

PRECLUDE.

SEAMDURA.

Dural substitutes are used in decompressive craniectomy (DC) in order to prevent adhesions during subsequent cranioplasty. Current literature attributes them to the reduced blood loss and reduction in operative time of cranioplasty. The use of double layer substitute has rarely been documented. We decided to study the use of double layer G-patch as a dural substitute in DC and evaluate its outcome during subsequent cranioplasty with special focus on flap elevation time and blood loss during cranioplasty.

MATERIALS AND METHODS: We performed emergency frontotemporoparietal (FTP) decompressive craniectomy using double layer of G-patch as dural substitute. Subsequent cranioplasty was done in these 35 patients. The development of adhesion formation between the tissue layers, amount of blood loss and flap elevation time was recorded.

RESULTS: During the cranioplasty, clear and smooth plane of dissection was found between the two layers of G-patch in all the cases. Average flap elevation time was 21.8 minutes and average time taken for cranioplasty was 124.12 minutes. Average blood loss was 83 ml. None of the patients required re-exploration for infection of bone flap or postoperative bleed.

CONCLUSION: While evaluating the use of dural substitute during DC as an adhesion preventive material for subsequent cranioplasty, flap elevation time and blood loss should be taken into account rather than the operative time. Double layer G-patch during DC facilitates subsequent cranioplasty by preventing adhesions between the layers resulting in easier dissection and reduced blood loss [2].

Unclassified

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