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Skull base-cranio-facial trauma with dura mater repair after subsequent CSF leaking, diagnosis treatment and outcomes. A systematic review of the literature

Daniel Encarnacion¹, Gennady Chmutin¹,
Bipin Chaurisia²

¹ Department of Neurosurgery of People of Friendship University, Moscow, RUSSIA

² Department of Neurosurgery, Bhawani Hospital and Research Centre, Birgunj, NEPAL

ABSTRACT

Background. Since there is a chance of serious neurological consequences, it is critical to demonstrate the diagnosis and treatment of craniofacial trauma with aetiologies such as extreme sports, motor vehicle accidents, and social trauma. Examining the effectiveness of methods for restoring the Dura after severe craniofacial and skull-base damage made worse by rhinorrhea and CSF leakage is our goal.

Methodology. In accordance with PRISMA (Preferred Reporting Items for Systematic Reviews) criteria, a systematic review was conducted. The following search terms were used: "Articles criticizing the analysis of open penetrating craniofacial injury with concurrent CSF leakage from the cranial cavity were examined and included, and associated pathologies, especially severe trauma of the upper and middle regions of the anterior cranial fossa." Rayyan - Intelligent Systematic Review Software A thorough search was conducted in databases like ScienceDirect and PubMed/MEDLINE before employing IBM SPSS Statistics for Windows, Version 26.0 (Released 2020; IBM Corp., Armonk, New York, United States), and EXCEL criteria for the statistical analysis.

Results. A total of 1584 patients with cerebrospinal fluid leaks were included in this investigation. Additionally, 698 patients were shown in Table 1 figure 2 and 886 patients in Table 2, figure 3-4-5. Rhinorrhea following trauma to the base of the skull, or craniofacial, was corrected by transnasal endoscopy in most cases and extracranial approach or craniotomy in fewer cases.

Conclusion. A thorough analysis of the outcomes within the context of healthcare reveals: 1. The efficacy of polyoxybutyrate membrane-based multilayer D-plasty. 2. This evaluation clarified that the inferred further planning for surgical suture material development was made.

Keywords

skull base fracture, cerebrospinal fluid (CSF), CSF fistula, subarachnoid haemorrhage, diagnosis and management of skull-base-craniofacial trauma, rupture of the dura mater



Corresponding author:
Daniel Encarnacion

Department of Neurosurgery of
People of Friendship University,
Moscow, Russia

Danielenencarnacion2280@gmail.com

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INTRODUCTION

The dura mater (DM), which encircles the brain and spinal cord, is the outermost layer of the meninges. The DM protects a number of other brain membranes, such as the pia and arachnoid mater. According to trauma characteristics, it is clarified that 38% of patients with frontobasal fractures suffered an injury as a result of an accident (17% of the 38% were caused by falls from substantial heights). Ten percent of patients have an unknown cause for the damage. Three percent of patients had injuries from playing contact or severe sports. [1].

Walter E. Dandy reported the ideal transcranial procedure in 1926 after achieving excellent Dura mater restoration using a bifrontal craniotomy for access and an autograft of the fascia lata for remodeling. With this craniotomy technique, one can access the ethmoidal roof and cribriform plate. A wide craniotomy is necessary to reconstruct or repair sphenoid sinus damage caused by trauma. Retraction of the cerebrum is necessary to locate the lesion, and reconstruction may be accomplished after surgery. [2].

Preferred biological or synthetic materials include fascia lata, pedicled galea, and pericranial flaps; sealants, such as fibrin glue, are used to keep flaps in place for a few weeks. Despite documented success rates of approximately 32.8%, there were nevertheless reported failure rates. Some writers argue that it is better to use sutures to seal the dura mater away from the defect. Because there is a risk of serious neurological consequences, it is critical to diagnose and treat cases of craniofacial trauma with aetiologies based on motor vehicle accidents, physical abuse in society, or intense sports as soon as possible. [3]. When it comes to reducing neurological sequelae, medical and physiotherapy are ineffective and do not stabilize patients' circumstances as well. In short, surgical intervention can be used to treat pathological abnormalities of the spine, spinal cord, and brain that are acquired, congenital, or the result of trauma. [4]. Surgical procedures such as resection of benign and malignant neoplasms, cerebrovascular interventions including aneurysmal repair, spinal procedures involving compression fractures, functional neurosurgery including epileptogenic zone obliteration seizures, and stroke interventions like thrombectomy are all performed by a sufficient number of departments within the neurosurgical

and spinal surgical disciplines. All of these activities demand the utmost qualification and accuracy throughout execution. [5]

The aims to demonstrate the efficacy of the techniques designed to restore the Dura after severe skull base injury exacerbated by rhinorrhea and cerebrospinal fluid (CSF) leakage.

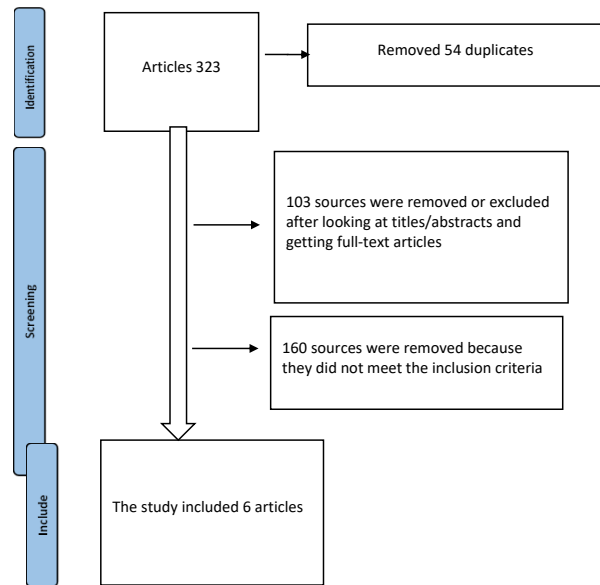


Figure 1. PRISMA Flowchart Traumatic Tear of the Dura Mater and Subsequent CSF Leak after Skull base, Craniofacial trauma.

Search strategy and mesh terms

Mesh terms related to Traumatic Tear of the Dura Mater, Craniofacial and Subsequent CSF Leak were incorporated into the search strategy. The selection criteria emphasized English-language journals published through 2024. Rigorous criteria were applied to ensure the relevance and quality of publications on various types of Traumatic Tear of the Dura Mater, Craniofacial and CSF Leak Injuries with associated pathologies.

("Cerebrospinal Fluid Leak/cerebrospinal fluid"[Mesh] OR "Cerebrospinal Fluid Leak/classification"[Mesh] OR "Cerebrospinal Fluid Leak/complications"[Mesh] OR "Cerebrospinal Fluid Leak/diagnosis"[Mesh] OR "Cerebrospinal Fluid Leak/diagnostic imaging"[Mesh] OR "Cerebrospinal Fluid Leak/drug therapy"[Mesh] OR "Cerebrospinal Fluid Leak/epidemiology"[Mesh] OR "Cerebrospinal Fluid Leak/etiology"[Mesh] OR "Cerebrospinal Fluid Leak/history"[Mesh] OR "Cerebrospinal Fluid Leak/immunology"[Mesh] OR "Cerebrospinal Fluid

Leak/mortality"[Mesh] OR "Cerebrospinal Fluid Leak/pathology"[Mesh] OR "Cerebrospinal Fluid Leak/physiopathology"[Mesh] OR "Cerebrospinal Fluid Leak/prevention and control"[Mesh] OR "Cerebrospinal Fluid Leak/rehabilitation"[Mesh] OR "Cerebrospinal Fluid Leak/surgery"[Mesh] OR "Cerebrospinal Fluid Leak/therapy"[Mesh]

Comprehensive search strategy keywords

In addition to the Mesh terms, keywords such as "Traumatic Dura mater ", "CSF Leak", "Skull trauma", "craniofacial trauma", "CSF Treatment and Outcomes.

Inclusion criteria

- Age range: from 18 years to 75.
- Traumatic and spontaneous Cerebrospinal fluid leak at the base of the anterior skull.
- MRI Strategies in Skull Base Injuries after Skull Base Trauma with Suspected Cerebrospinal Fluid Leak.
- Spontaneous cerebrospinal fluid after trauma to the skull base of the middle fossa associated with otorrhea patients with skull base trauma after dural repair and with CSF control and with suspicion of meningitis.

Exclusion criteria

Patients without cerebrospinal fluid leak after skull base trauma and without alteration of the Glasgow scale

Patients diagnosed by imaging without injured adjacent structures and without CSF leak patients under 18 years of age with craniofacial trauma but without injury to the entire length of the skull bas

Data extraction and analysis

Standardized search methods and a careful review of pertinent research publications were used to obtain data from eligible studies. Obtaining comprehensive data on research on CSF leak injuries, craniofacial trauma, and traumatized tear of the dura mater with related diseases was part of the data gathering process. The authors' information, the parameters utilized for control in comparative studies of the injury, the adult population studied's demographics, and the specifics of the interventions were all considered. the sort of study and the year it was published.

Analytical statistics

The data analysis was conducted using SPSS software version 26.0 from IBM Corporation located in Armonk, NY, USA. The results were presented as mean \pm standard deviation values. The fracture classification test Leford kinds 2-3 was applied. Using craniofacial-skull based injuries as the basis for statistical comparisons in CSF confirmation, a p value of less than 0.05 was deemed significant.

RESULTS

A total of 1584 patients with cerebrospinal fluid leaks were included in this investigation. Additionally, 698 patients were shown in table 1 figure 2 and 886 patients in table 2, figure 3-4-5. Rhinorrhea following trauma to the base of the skull, or craniofacial, was corrected by transnasal endoscopy in most cases and extracranial approach or craniotomy in less cases.

In a research conducted from 2013 to 2022, FCL repair using hydroxyapatite cement was performed on 55 patients with a total of 60 faults and only 5 bilateral repairs. The favorable outcomes included 91.6% with 55 corrections. The tegmen tympani region was the most often repaired area. Acetazolamide was provided to these individuals prior to a second successful surgical intervention. In addition, five of these patients experienced headaches during the recovery phase, and three (5.4%) had VP shunts to lower intracranial pressure. 34 research publications covering the years 2000–2023 focused primarily on post-traumatic cerebrospinal fluid leaks, which are primarily the result of car accidents. where men made up 20% of the injured and women made up 80%. where bifrontal craniotomy and endonasal endoscopy were the most often used techniques, both of which produced excellent results following the intervention. It is more susceptible to longitudinal ruptures because a larger number of sheath components permit longitudinal orientation. Patients with upper and middle facial zone fractures involving the anterior cranial fossa were distributed as follows in terms of local cranial injuries. Twenty percent of patients experienced hemorrhage as a result of blood clots or accumulation in the intracranial subthecal space, while fifty-six percent of patients suffered contusion brain lesions. (Figure 1). [6,8,9, 10, 51]

In an additional study conducted between 2012 and 2016, clinical data were gathered prospectively and retrospectively in a sequential manner to analyze potential risk factors for postoperative leakage of the multilayer base layer after a dural suture. utilizing a modification of the repair technique based on the degree of intraoperative CSF leak; among the 388 procedures performed, 10 EEAs were employed to account for 2.6% of the postoperative CSF leak cases following suture repair. [12, 13, 14, 15, 16, 52]. This study examines CFL leaks caused by trauma or spontaneous events that were successfully repaired endoscopically using a combination of endoscopic and trepanation techniques between 2015 and 2019. The study found no significant problems related to the patent frontal sinus trip. Most of the time. and just two individuals with synechiae development had a revision procedure. and there was a 22.7-month follow-up, with a range of 7-41 months. [17, 18,19, 20, 53].

Table 1. After trauma involving skull base defects, CSF is repaired using endoscopy in a transnasal, sphenoidal, and extracranial manner.

Authors	Type of Study	Year	Pt.	Management repair	Surgical approach	Follow up
Castillo et al. [21].	Clinical trial	1999	27	CSF rhinorrhea	Endonasal approach under optical guidance	24.7 months.
Hughes et al. [22].	Retrospective	1997	17	CSF leak/ Anosmia	primary endoscopic r	32 months
Klotch et al. [23].	Review	1998	15	CSF leak	Endoscopic approach /extracranial approach	
Mattox et al. [24].	Case report	1990	5	Cerebrospinal fluid leaks/ nasal cephaloceles.	Endoscopic sinus surgery	N/A
Anand et al. [25].	Research	1995	92	CSF leak /sinusitis	Functional endoscopic sinus surge	N/A
Dodson et al. [26].	Retrospective	1994	76	Recurrent CSF rhinorrhea	Functional endoscopic sinus surgery	3 to 43 months.
Burns et al. [27].	Retrospective	1996	42	Cerebrospinal fluid rhinorrhea / cephaloceles	Endoscopic procedure	5 to 68 months
Lanza et al. [28].	Retrospective	1996	94	CSF leakage	Endoscopic repair of skull base defects	2 to 57 months.
Schick et al. [29]	Retrospective	1997	95	Cerebrospinal fluid (CSF) rhinorrhea	Endoscopic	6 weeks to 4 Months-13 years

Musain et al. [30]	Retrospective	2003	9	CSF	Neuroendoscope	5 Months-8 years
Nachtigal et al. [31].	Retrospective	1999	12	Cerebrospinal fluid rhinorrhea	Intranasal endoscopic approach	N/A
Casiano et al. [32].	Retrospective	1999	97	CSF rhinorrhea	Endoscopic repair	29 months
Marks et al. [33].	Research	1998	18	CSF leaks	Endoscopic approach	N/A
Marshall et al. [34].	Research	2001	78	Sphenoid CSF leaks	transnasal endoscopic techniques	N/A
Mao et al. [35].	Research	2000	21	CSF leaks	Endoscopic approach	N/A

CSF Leaking Repair

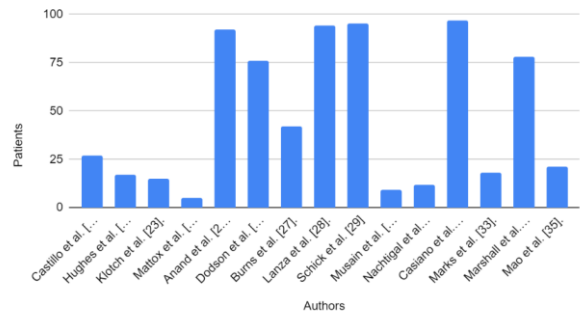


Figure 2. Integrative Research Projects CSF repair following transnasal endoscopy technique, dura mismatch, and skull base trauma.

Table 2. Study group for repairing cerebrospinal fluid leaks using various methods and strategies.

Authors	Types of study	Year	Patients	Method	Techniques	Follow up	Journal
Chin et al. [36].	Retrospective	2003	37	CSF repair	Transnasal endoscopic closure of anterior skull base fistulas		Wiley
Castellon et al. [37].	Review	2001	31	CSF repair/ rhinorrhea	Endoscopic approach	1-year minimum follow-up.	American Journal of Rhinology & Allergy
Lund et al. [38].	Retrospective	2002	36	CSF repair/	Endoscopic	N/A	American Journal of

				rhinorrhea	approach		Rhinology & Allergy
McMains et al. [39].	Retrospective	2004	92	CSF rhinorrhea	Endoscopic approach	25 months	Wiley
Lee et al. [40].	Retrospective	2004	39	CSF rhinorrhea	Endoscopic approach	N/A	Wiley/The Laryngoscope
Lindstrom et al. [41].	Retrospective	2004	53	CSF rhinorrhea	Endoscopic approach	N/A	Wiley/The Laryngoscope
Husain et al. [42].	Retrospective	2003	9	CSF rhinorrhea	Endoscopic approach	5 months to 8 years	Skull Base: an Interdisciplinary Approach
Tosun et al. [43].	Retrospectively	2005	26	CSF repair	endonasal endoscopic approach/ craniotomy	N/A	Minimally Invasive Neurosurgery
Landeiro et al. [44].	Research	2004	10	CSF repair	endoscopic repair - skull base defects	recurrence 14 months later	Minimally Invasive Neurosurgery
Briggs et al. [45].	Clinical trial	2004	52	CSF repair	endoscopic approach	27 months	Clinical Neuroscience
Gendeh et al. [46].	Retrospective study	2005	16	sphenoid leak repair.	Endoscopic approach		J Laryngol Otol
Kirtane et al. [47].	Retrospective	2005	267	CSF repair	Transnasal endoscopic approach	N/A	Wiley/Otolaryngol Head Neck Surg
Araujo et al. [48].	Retrospective	2005	44	CSF rhinorrhea	Intranasal endoscopic approach	2 to 102 months	Braz J Otorhinolaryngol.

Bernal-Sprekelson et al. [49].	Retrospective chart study	2005	39	CSF repair	Endoscopic skull base surgery	65 months	Rhinology
Locatelli et al. [50].	Clinical trial	2006	135	CSF repair	endoscopic endonasal technique	N/A	Operative neurosurgery

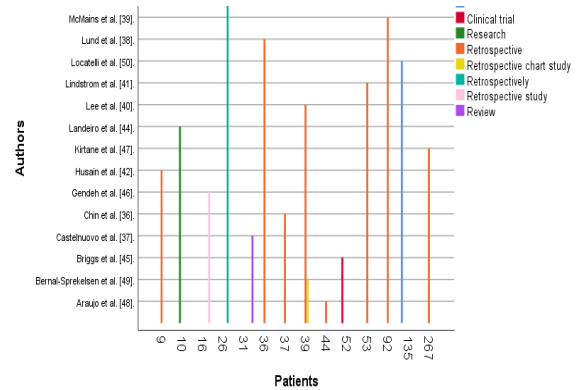


Figure 3. An illustration of the study group's strategy for fixing a cerebrospinal fluid leak using several methods and strategies.

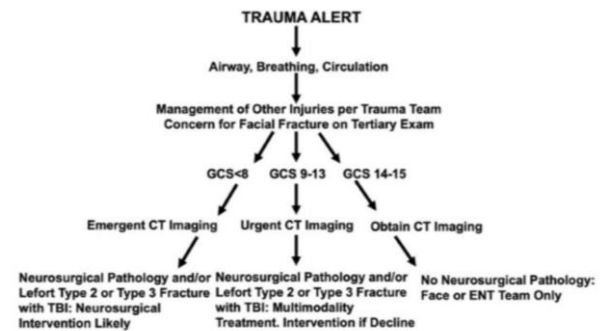


Figure 4. Flow diagram of the Management of craniofacial-skull base trauma per Leford types 2-3 fracture classification.

Fifteen per cent of patients had a haemorrhage in the cranial cavity, and nine per cent of people had an abnormal accumulation of air in the cranial cavity. Detailed data can be found in Figure 5.

Among patients with Frontobasal fractures, which are complicated by the outflow of cerebrospinal fluid (this aspect requires an operation), the frequency of detection of one-time injuries is as follows:

nasoethmoidal complex - seventeen and a half per cent; a paired cavity in the skull containing the eyeball with its appendages - 35.6 per cent; the lower wall of the orbit - 9 per cent; complex, including the zygomatic bone, lower, lateral wall of the orbit - 28.4 per cent; upper, lower jaw (8 per cent; 2.5 per cent).The status, which reflects the state of the nervous system, and cerebral, focal symptoms, was assessed by specialists after the initial intake, as well as in dynamics.[54]. In this case, focal symptoms can be divided into several categories.



Figure 5. The incision in the pericranial membrane and revision of the anterior base of the skull (A) enlarged bifrontal coronal incision originating from the zygomatic level to the contralateral zygomatic level. (B) A wide subgaleal dissection of the pericranial membrane was performed to the edge of the orbital rim to harvest the anterior-based vascularized graft. (C) The area outlined by the red line from the scan for lesions of the dura mater and skull base.

Craniofacial symptoms due to the specifics of the injury

Focal symptoms associated with trauma to functionally important brain areas

The first category of symptoms (discussed in the first table) involves dysfunction of the nerves extending from the brain. To localize the fistula, layer-by-layer scanning X-ray visualization of the CSF spaces of the brain was performed for thirty-six patients. It has been found in various places. This aspect could be observed at the same time with the problem of the bones of the skull, covering the brain from above, as well as from the sides; cranial base defect. [55].

Table 3. The frequency of localizations of CSF fistula in the anterior cranial fossa.

Craniobasal symptoms	%	CSF Fistula localization	%
Hyposmia, Anosmia	42	Ethmoid plate and roof of ethmoid cells	72,2
Oculomotor disorders	33	Frontal sinus	19,4

Violation of the function of the first and second branches of the V nerve	21	Site of the sphenoid bone	8,4
Violation of visual acuity (II pair of Craniocerebral insufficiency)	8		

The criteria for carrying out such activities are as follows: local outflow of Cerebrospinal fluid from the cranial cavity due to trauma to the bones of the base of the skull, the dura mater (it requires neurosurgical care); the same symptoms with significant defects in the bones of the vault, the cranial base. The most common symptom directly related to CSF leakage through defects in the dura mater is headache due to hypotension. Tension of the neck muscles, pathology of photophobia, and nausea. The pain in the head became greater in the upright position. Also, coupled with the indicated problems, fractures of the posterior walls of the paranasal sinuses located in the frontal bone can be observed. In case of complications of craniofacial damage, the goal of the operation is to remove contusion foci. surgeons treat a depressed fracture; eliminate the specifics of air accumulation inside the cranium. To neutralize the influence of excessive accumulation of fluid in the brain cells, bifrontal decompressive trepanation is performed. [56].

A standard extended bifrontal craniotomy was performed at each procedure

Typically, when harvesting biregular-type pericranial flaps, the bifrontal flap is lifted, and the frontal sinuses are remodeled by exposure without using the entire retractor in skull base trauma.when advancing to extradural dissection while using the microscope. The comminuted pieces of the anterior sinus should be removed with the utmost caution and using the high-speed craniotome to remove the sinus mucosa in the procedure up to the frontal nasal canal and careful look under the microscope, the dura mater was opened widely in terms of the location of the defect where it extended to the sellae tubercle, thus durotomy simplified the repair performed and through meticulous elevation through the durotomy to allow the dura to be moved at will without lacerating it. For the defects, a synthetic Dural graft was obtained as free tissue and

this material was used for the Dural graft. and so, in the flap, we place an additional piece in the epidural space. Thus, we can use clips on the sutures, securing the pericranial flap, and reducing its postoperative migration. note that 38% with an indication for urgent surgical intervention for a subgroup can be called local cranial pathology, in which brain dislocation is observed; skull fracture; other injuries. 6% development of meningitis. 5% were declared dead. [15, 57]

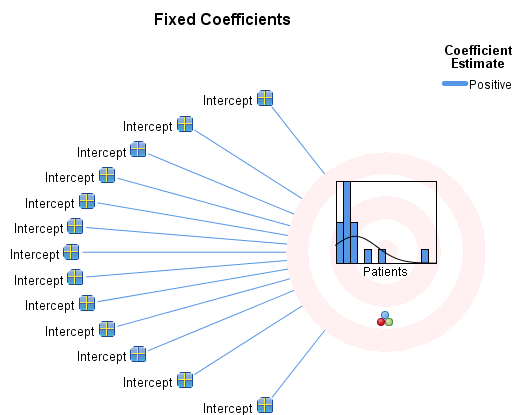


Figure 6. Covariance parametros Patients Subjects, Specifications for Residual and Radom Effects by CSF leaking.

Dura defects are sutured (when possible) and then closed

Therefore, medical professionals conduct plastic surgery of the cranial base fistula when there is a major post-traumatic defect in the depression in the cranial base, which is home to the projecting frontal lobes of the brain, as well as liquorrhea. In this case, a vascularized flap is employed. The success rate for free flap materials is greater than 95% ($p < 0.05$) when there is concurrent cerebrospinal fluid leakage from the cranial cavity as a result of bone trauma and a minor anterior fossa defect (less than 0.5 cm). According to the analysis under review, there is consensus regarding the general order of events while using surgical suture material, taking the defect's size into account. It was feasible to diversify the entire list of efficient materials utilized to seal the neurocranium in this instance since biodegradable material was used for Dural plasty. In another, he performed frontal sinus surgery to address chronic inflammation; he also removed the posterior wall of the sinus; he performed dural revision and D-plasty;

and he performed D-initial bone plasty of the cranial vault. A 2% patient developed meningitis. There have been two patient deaths. Twenty patients had a functional outcome based on a quality-of-life scale. Within a span of one to three days, 39% of patients had extradural dura mater, skull base plasty, and cranial trephination with soft tissue and bone flaps. In 1% of cases, a localized buildup of pus was discovered in the brain's material. [58].

DISCUSSION

Traumatic brain injury, per craneocephalic trauma severe and skull base fracture, cause CSF fistula of cerebrospinal fluid is an important problematic aspect for study. By statistics increase in the frequency of severity of such injuries, without craniofacial reconstructions accord neurosurgeons and maxillofacial surgeons sometimes in combinations of orthopaedic department without the normal response of the situation can increase the level of not survival, in the section of surgery that considers the treatment of acute craniocerebral, spinal cord diseases - all these aspects affect the demand for a detailed analysis of the problem. Often there is a pathology in which the skull, brain, and skeleton of the face are damaged at a time. Such pathologies are difficult to treat. If we compare this symptomatology with damage to the lower facial region, damage to the brain at the same time as the upper, middle facial zone can lead to the not survival of the patient. There may be a symptom of CSF leakage from the cranial cavity; pathological accumulation of air in it. [59].

Various products were used in the D-plasty process of the canal through which the cerebrospinal fluid circulates (including a periosteal flap, adipose tissue, comb cue, and artificial dura mater). Perform a transcranial extradural plasty of the channels through which the cerebrospinal fluid circulates. The specialists used different materials. Often the plastic was 3-layer. Cerebrospinal fluid leakage in 8%. In 5% this symptomatology ceased as part of non-surgical medical care. external lumbar drainage was performed. The combination of materials "periosteal flap + Tachocomb 14% was used. When using the combination of materials "connective tissue + Tachocomb + artificial dura mater", no recurrence of the problems was observed either. Using a set of materials "connective tissue, cue comb, artificial dura", repeated manifestations of CSF leakage were

observed in 17%.To apply the clips, we use a series made up of a rotating piece of using approximately 8 cm curved that leaves a better field of vision. and each piece contains 25 clips. When using the “larger size” clips, their interior is about 3 mm for surgical use of each. but the most suitable would be 2-3 mm clips. [60].

In the last 10-15 years, there has been a general increase in the number of injuries to the lower parts of the cranial vault within the overall structure of the analyzed injuries by one and a half to two times. These trends are caused by a change in the specificity of aspects leading to injury (for example, indicators of damage due to road accidents, violent injuries), an improvement in the quality of the diagnostic activity of physicians, the creation and integration of advanced protocols for X-ray computed tomography of the skull and adjacent departments [5, 6, 60].

The Polyoxybutyrate membrane in some cases is used for dura mater defect repair. The material absorbs water and is durable. It does not need to be additionally fixed with surgical glue. Specialized multilayer plasty of cerebrospinal fluid outflow

channels was performed for nineteen per cent of patients to avoid many complications. The membrane made of polyoxybutyrate (thickness - two hundred microns) is suitable for plastics of the dura mater[7, 9]. [19]. [60]

Simultaneous use of adipose tissue, tacho-comb, and wide femoral fascia did not allow complex sealing of the cranial cavity. Complications in less than thirty-six per cent of cases.[20].

Multilayer D-plasty of the CSF fistula with the use of a specialized flap showed overall effectiveness in significant (more than five-tenths of a centimeter) post-traumatic defects of the ACF. There were no recurrences of pathology in the considered subgroup. Within small ACF defects (less than 0.5 cm), the success rate of free flap products exceeds ninety-five per cent (p < 0.05) For patients with PBL, a significant post-traumatic defect for the cranial bases, to reduce the risk of complications, doctors use multilayer D-plasty. In the context of open injuries in the region of the lower parts of the cranial vault, when the periosteal flap is damaged, perifascial tissue can be used as an autograft. [11]. [60].

Table 4. Probability distribution: Multinomial Link function: Generalized logit a. Target: Patients

Fixed Coefficients^a

Patients Model Term	Coefficient	Std. Error	t	Sig.	95% Confidence Interval		Exp (Coefficient)	95% Confidence Interval for Exp (Coefficient)	
					Lower	Upper		Lower	Upper
9 Intercept	2.137E-15	1.4142	.000	1.000	-6.085	6.085	1.000	.002	439.163
10 Intercept	2.026E-15	1.4142	.000	1.000	-6.085	6.085	1.000	.002	439.163
16 Intercept	2.026E-15	1.4142	.000	1.000	-6.085	6.085	1.000	.002	439.163
26 Intercept	2.082E-15	1.4142	.000	1.000	-6.085	6.085	1.000	.002	439.163
31 Intercept	2.137E-15	1.4142	.000	1.000	-6.085	6.085	1.000	.002	439.163
36 Intercept	2.137E-15	1.4142	.000	1.000	-6.085	6.085	1.000	.002	439.163
37 Intercept	2.137E-15	1.4142	.000	1.000	-6.085	6.085	1.000	.002	439.163
39 Intercept	.693	1.2247	.566	.628	-4.577	5.963	2.000	.010	388.697
44 Intercept	2.026E-15	1.4142	.000	1.000	-6.085	6.085	1.000	.002	439.163
52 Intercept	2.026E-15	1.4142	.000	1.000	-6.085	6.085	1.000	.002	439.163
53 Intercept	2.137E-15	1.4142	.000	1.000	-6.085	6.085	1.000	.002	439.163
92 Intercept	2.137E-15	1.4142	.000	1.000	-6.085	6.085	1.000	.002	439.163
135 Intercept	2.054E-15	1.4142	.000	1.000	-6.085	6.085	1.000	.002	439.163

CONCLUSION

A comprehensive study of the results obtained in the framework of medical care indicates:

1. the effectiveness of multilayer D-plasty when using a polyoxybutyrate membrane.
2. As part of the analysis, information was obtained that it is possible to develop a strategy for the selection of surgical suture material.
3. In the context of the algorithm of actions, the factor of the magnitude of damage to the

cranial base is taken into consideration.

4. The Incidence of skull base fracture provides round-the-clock findings of patients involved in these types of emergencies, pathologies, and complications that should be treated.

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