Euro Surgery 2020: Using Eggshell Membrane in the Fresh Cadaveric Cow Brain for Brain Protecton

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The aim of this experimental study was to evaluate the use of eggshell membrane in the protecton of brain tssue from the harmful mechanical efect of metallic microsurgical instruments during neurosurgical interventons. Methods: Thirty uncovered fresh cadaveric cow brains were equally divided into two groups: group with eggshell membrane group (Group I) and without eggshell membrane group (Group II). In Group I, eggshell membrane was sprawled over the lef lateral side of the interhemispheric sulcus of the anterior brain surface. The mechanical traumatic efects of the metallic surgical instruments were divided into three groups: minor, moderate and severe. Results: In Group I (n=15), the number of minor injured brains was found to be 12 (80%). In Group II (n=15), the number of minor injured brains was found to be 5 (33.33%). On the contrary, the number of moderately injured brains parenchyma in Group I cow brains was estmated to be 2 (13.33%). However, the number of moderately injured brains in Group II was found to be 9 (60%). The number of severe injury was found to be 1 (6.67%) in Group II. The number of same injury was also found to be 1 (6.67%) in Group I. Conclusion: This study showed that protectng the naked brain tssue from the mechanical injury efect of metallic microsurgical instruments with covering of eggshell membrane is feasible. It is believed that this material might contribute to the practcal microneurosurgery in protectng the brain tssue.

Introducton: Micro neurosurgical operatons require diferent metallic instruments during the surgical treatment of pathologic lesion located within the brain tssue. The protecton of the neurovascular structure of the brain is an extremely important and critcal point in all kinds of micro neurosurgical interventons. Theoretcal and practcal trained micro neurosurgical ability is not sufcient in protecting the brain parenchyma from the mechanical injury of the metallic microsurgical instruments during the surgical interventon to the brain tssue. Specifc micro neurosurgical techniques such as proper use of the operatng microscope, holding and grasping of the micro neurosurgical instruments, proper microsurgical techniques for the opening of the arachnoid membranes, safe and delicate neurovascular dissecton, and carefully and properly micro drilling of the cranial base bones should be learned before performing an operaton [1-4].

Theoretcal knowledge, practcal techniques, and microsurgical operatve disciplines for protectng delicate brain and related structures located within the cranium are mainly provided during the residency years of neurosurgical educaton [1,2]. Spending of tme in experimental microsurgical laboratory to practce some kinds of microsurgical models such as dissecton and suturing of the rat external carotid artery, dissecton and evaluaton of the abdominal vena cava of rats, suturing of the plastc glove materials by using micro forceps under the operating microscope, drilling and dissecton of the some cadaveric bone materials are essental improving and gaining of advanced microneurosurgical practcal techniques [1,2,4]. Metallic surgical instruments may mechanically injure the delicate brain parenchyma and related structures such as cranial nerves and vascular structures in the microneurosurgical operatons. Some specifc materials may be used in the protecton of brain tssue from the harmful efect of metallic instruments. The aim of this experimental study was to evaluate the use of eggshell membrane

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sheet in the protectng naked brain tssue from the harmful mechanical efect of metallic microsurgical instruments. Experimental fndings, di f cultes, practcal methods and suggestons were discussed under the light of the literature.

Materials and Methods: All microneurosurgical actvites were performed under the operatng microscope in this experimental study. An experimental microneurosurgical brain protecton model was created using fresh cadaveric uncovered cow brain for evaluatng the e f cacy of eggshell membrane. The cow brains were equally divided into two groups: group with eggshell membrane (Group I) and without eggshell membrane group (Group II). In Group I, the eggshell membrane was sprawled over the lef lateral side of the inter hemispheric sulcus of the anterior brain surface. The eggshell membrane should be held carefully from both ends using a micro bayonet. Sprinkles of some water over the brain surface before sprawling of the eggshell membrane facilitate the use of the material. Dissecton of the inter hemispheric fssure using micro bayonet and micro scissor is shown in Figures 1 and 2, respectvely.

In Group II, no material was used for brain protecton. Micro bayonet, micro scissor, micro dissector, the metallic tp of the aspirator and bipolar forceps were used in the dissecton, distracton and separaton of inter hemispheric fssure in two groups. The operaton was started with the cu t ng of arachnoid membrane over the inter hemispheric fssure using the micro scissor. It was followed with the separaton and distracton of the fssure by using micro bayonet, micro dissector, and the tp of the aspirator. Microdissecton and separaton were contnued untl the corpus callosum was reached. Following the completng of dissecton of the inter hemispheric fssure, advanced separaton and distracton was performed using metallic Leyla retractor 1 cm in width of the retractor blade. Two-centmeter separaton from the opposite brain hemisphere was performed for 20 min. In Group II, the eggshell membrane was not used for protectng brain tssue. All aforementoned operatng procedures were performed by team in the same way for same tme. Next, all operated brains were sliced regularly (0.5 cm) from the anterior to the posterior directon for evaluatng the harmful efects of metallic instruments and open biopsy micro-separator on the brain parenchyma. All brain slices were evaluated under the magnifcaton of the operatng microscope in terms of contusion, tearing, distorton, and other traumatc features. The mechanical traumatc efects of the metallic surgical instruments were divided into th Ś e ù g ł ľ . Ğ Ŭ hude Ś a ˆ e Ł ŭ e u x ŭ e Ñ ul ă s u m Ő llh u e ù ŭ rain ated

well-known and recognized for a safe microneurosurgical interven t on [1-4]. The use of these instrumen

dissecton progressed, the eggshell membrane was carefully pulled deep into the dissected and separated inter hemispheric sulcal space. The metallic brain component of the Leyla retractor was kept for 20 min. on the right hemisphere to retract the brain 2 cm lateral from the opposite hemisphere with standard chain retracton resistance. This was the fnal part of the experimental process. The presence of contusion, distorton and laceraton were evaluated on the sliced brain materials using the operatng microscope. The diferences between protected and unprotected brain slices in terms of traumatc brain injury were quite clear. The protected brain hemispheres with egg shell membrane have less contusion, distorton and laceraton injury compared with the unprotected brain hemispheres. Laceraton and distorton are more common injuries in unprotected brain hemisphere.

Conclusion: This study showed that protectng the naked brain tssue with covering of eggshell membrane from the mechanical harmful efect of metallic microsurgical instruments is feasible. It is believed that this material might contribute to the practcal micro neurosurgery in protectng brain tssue under the magnifcaton of operatng microscope.

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