

# Repair of stomach defects by dehydrated dura mater patch in the rat\*

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*In this study, defects on the anterior gastric body 6mm in diameter of the male Sprague-Dawley rats were repaired by dehydrated human dura mater patch. The rats were divided into 4 groups, 7 rats in each. All rats survived at the postoperative period. The rats were sacrificed at 3rd, 7th, 14th and 21st days. Macroscopically on the 21th day, the defect was covered by gastric mucosa. In histopathologic evaluation at the 3rd and 7th days no surface epithelium and mucosal regeneration was encountered. On the 14th day surface epithelium regeneration was partial, but no mucosal restoration was present, newly formed collagen fibers were replacing 25 to 75% of the dura patch. At the 21th day postoperatively surface epithelial regeneration was completed, mucosal reconstruction had newly started. Newly formed collagen fibers had almost completely replaced the dura patch (<75%). [Turk J Med Res 1997; 15(1): 6-7]*

**Key Words:** Dura Mater, Stomach, Patch (Dura.Mide.Yama)

The healing of stomach defects by various autologous, heterologous and prosthetic materials were studied (1,2).

In this study we have repaired gastric body defect of Sprague-Dawley rats by dehydrated human dura mater in order to observe the evolution of the healing process and the morphological changes of the dura graft in acid milieu.

## MATERIALS AND METHODS

In this study 28 male Sprague-Dawley rats weighting 280±40g were used. Following ether inhalation anesthesia median laparotomy were performed. Approximately 6mm in diameter defect was done on the anterior wall of the gastric body by excision. A same diameter dehydrated human dura mater patch (Tutoplast Dura Pfrimmer-Viggo) was stiched by continous 5/0 polypropylene sutures. Laparotomy was closed by 2/0 silk sutures. 5 ml 0.9% isotonic saline was injected intraperitoneally for resuscitation. Postoperatively at the 12th hour rats were allowed to drink and at the 24th hour were fed by commer-

cial rat chow ad libidum. The rats were divided into 4 groups as 7 in each. Postoperatively after 3rd, 7th, 14th and 21st days the rats were sacrificed by high dose of ether anesthesia and the healing of patched area was evaluated histopathologically.

For histopathologic evaluation anterior wall of stomach was excised and washed by isotonic saline. Following this procedure the specimen was fixed in 10% formaldehyde. The specimen was then embedded in paraffin and 4 to 5 micron in thickness sections were taken and these were stained by Haematoxyline Eosin and Van Gieson. The micro specimens were examined for to detect the degree of the regeneration of the surface epithelium and mucosal reconstruction, the degree of the inflammatory cell infiltration, the ratio of the newly formed collagen to dura mater patch and the degree of foreign body reaction.

## RESULTS

In the postoperative period all rats survived. After sacrifice, in all rats the patch area was covered by liver, omentum, small intestines and transverse colon. No leakage and fistula had been observed. Macroscopically on the 21th post operative day defect was covered by gastric mucosa. According to the results of the histopathological examinations (Table 1): at the 3rd postoperative day no surface epithelium and mucosal regeneration was encountered. Inflammatory cell infiltration was intensive and foreign body reaction was moderate; at the 7th postoperative day no surface epithelium and mucosal regeneration was encountered. Inflammatory cell infiltration was intensive, foreign body reaction was moderate. The newly formed collagen fibers replace more than

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**Table 1.** Histopathological Findings

	Surface epithelial regeneration	Mucosal reconstruction	Inflammatory cell infiltration reaction	Foreign body	Dura/Newly formed collagen ratio
3 <sup>rd</sup> day	(-)	(-)	(+ + +)	(+ ')	(-)
7 <sup>th</sup> day	(-)	(-)	(+ + +)	(' ')	>25 %
14 <sup>th</sup> day	partial	(-)	(' ')	(-)	25-75 %
21 <sup>st</sup> day	complete	newly started	M	(+)	>75 %

25% of the dura mater patch. At the 14th postoperative day surface epithelium regeneration was partial but no mucosal restoration was present. Inflammatory cell infiltration was moderate, foreign body reaction was low. Newly formed collagen fibers replaced 25-75 % of the dura mater patch. At the 21th postoperative day surface epithelial regeneration was completed. Mucosal reconstruction had newly started. Inflammatory cell infiltration was moderate, the foreign body reaction was low. Newly formed collagen fibers almost completely replaced the dura mater patch.

## DISCUSSION

In the previous experimental studies in literature gastric defects in rats were repaired by various autologous, heterologous and prosthetic materials (1,2). The healing process of the gastric defects repaired by lyophilized bovine tendon collagen sponges and the leiomyosclerotic colonic buttons showed an initial development of granulation tissue transforming to scar tissue with gastric mucosa growing over (1). In gastric body, defects repaired by pedicled colonic patches, no mucosal disruption and a progressive gastric like morphological transformation was observed during 2 to 12 months after the experiment (1). In another experimental study in which fundic defect repaired by polytetrafluoroethylene patch, the graft was covered with keratinized squamous epithelium at 30th day (2). In our study the gastric body defect was repaired by dehydrated human dura mater patch and it was observed that the whole defect was covered by gastric mucosa with complete surface epithelial regeneration and mucosal reconstruction had nearly started at 21st day. The dura patch was almost completely replaced by the newly formed collagen fibers. The collagen in homologous dura mater did not survive and was replaced by the recipients own tissue (3,4). In our study the dura mater patch was not influenced by the acidic content of the stomach and was replaced more than 75% by the newly formed collagen fibers. The human dura mater was suggested as a tissue substitute in 1955 at Naval Medical Research Institute (4,5). Since that time the human dura has been used for the repair of various tissue losses in human body. Thoracic and abdominal wall replacement, craniofacial reconstruction, esophageal repair, bladder extrophy repair, tracheal reconstruction are some of these clinical applications (3-9). According to the

results of our experiment the gastric body defects in rats can be repaired by dehydrated human dura mater patch. The feasibility of this procedure in humans also should be investigated.

## Ratlarda mide defektlerinin dehidrate dura mater yamaya anarılması

*Bu çalışmada erkek Sprague-Dawley ratlarının mide ön duvarındaki 6 mm çapındaki defektler dehidrate insan dura mater yamasıyla anarılmıştır. Ratlar herbirinde 7 siçan olmak üzere 4 gruba ayrılmıştır. Bütün siçanlar postoperatif dönemde sağ kalmışlardır. Ratlar 3., 4., 14. ve 21. günde sakrifiye edildiler. 21.günde defekt makroskopik olarak gastrik mukoza ile kaplanmıştır. Histopatolojik değerlendirmede 3. ve 7. günlerde yüzey epiteli ve mukoza rejenerasyonuna rastlanmamıştır. 14. günde yüzey epitel rejenerasyonu kısmi olmuş; ama mukozal yenilenme olmamıştır. Yeni oluşmuş kollajen lifleri, dura yamanın %27 ila 75'inin yerini almıştır. Postoperatif 21. günde; yüzey epitel rejenerasyonu tamamlanmış; mukozal rekonstrüksiyon yeni başlamıştır. Yeni oluşmuş kollajen lifleri dura yamanın neredeyse tamamının yerini almıştır (<75%). [T Klin Araştırma 1997; 15(1): 6-7]*

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