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The effect of electrocauterization for internal thoracic artery harvesting during coronary artery bypasses grafting: an ultrastructural study

S. Gonca[1], B. Onan[2], I.S. Onan[2], S. Solakoğlu[3], I. Bakır[2], M. Yeniterzi[2]

[1]Kocaeli University, Histology and Embriology, Kocaeli, Turkey
[2]Istanbul Mehmet Akif Ersoy Thoracic and Cardiovascular Surgery Training Hospital, Department of Cardiovascular Surgery, Istanbul, Turkey
[3]Istanbul University Medical Faculty, Department of Histology and Embriology, Istanbul, Turkey

suhgonca@gmail.com
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Preparation methods of internal thoracic artery(ITA) as a coronary graft can be performed by different dissection techniques [1,2]. We aimed to morphological investigate the effects of electrocautery during ITA harvesting on vessel wall morphology at the cellular or ultrastructural level.

Ethics committee approval was received for this study. Proximal sections of ITA grafts from total 10 patients who underwent coronary artery bypass surgery(CABG) were studied in two groups. The ITA grafts were harvested in the control group with mechanical dissection (n=5) using scalpel and clips. Conventional electrocautery was used in the study group (n=5).Transmission electron microscope(TEM): The fixation process was performed for 24h within 2.5% phosphate buffered glutaraldehyde solution at +4 ºC. Then, post fixation was performed within 1% phosphate buffered osmium tetroxide (OsO_4) for an hour, dehydrated by ethyl alcohol series and then embedded in Epon 812. Thin sections (400-600 Aº) were cut with ultramicrotome (LKB) and were stained using uranyl acetate and lead citrate. Finally, sections were evaluated with Jeol JEM 1011 TEM.

In control group, luminal surfaces were lined by normal limits of the original squamous epithelium. The endothelial cell had a very distinct attachment to the basal membrane and cytoplasmic organelles were evident (Figures1a and 1b). However, morphologic integrity of endothelial cells was distorted in the electrocautery group. Endothelial cells showed numerous large cytoplasmic vacuoles and nonvisible cytoplasmic organelles.In subendothelial layer was showed disintegration(Figures 2a, 2b).

We analyzed the incidence of damage to the vascular layers after harvesting of ITA using electrocautery.There were ultrastructurally significant differences in both groups. The integrity of endothelial cells and the vessel layers of the ITA were better preserved when the ITA was removed from its native vascular bed using the scissor method rather than using electrocautery method.

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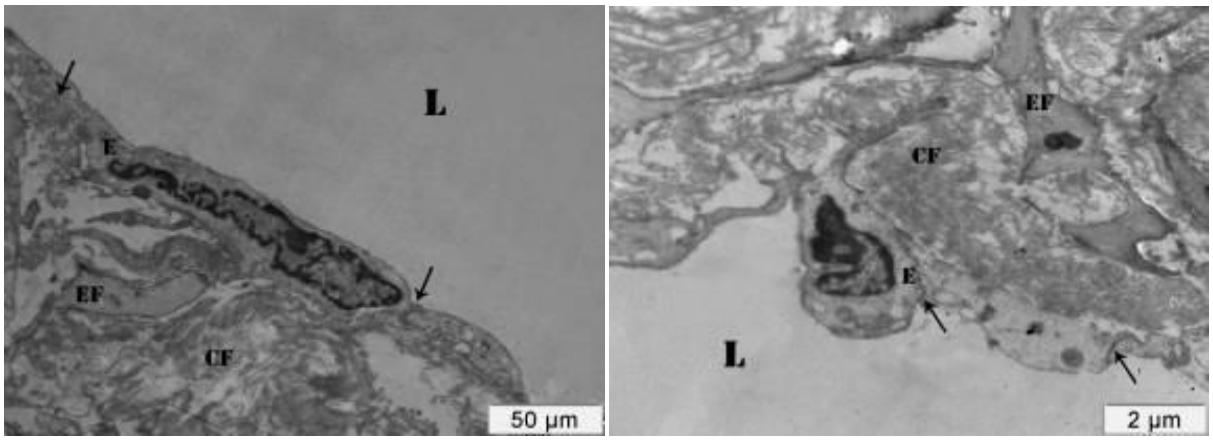
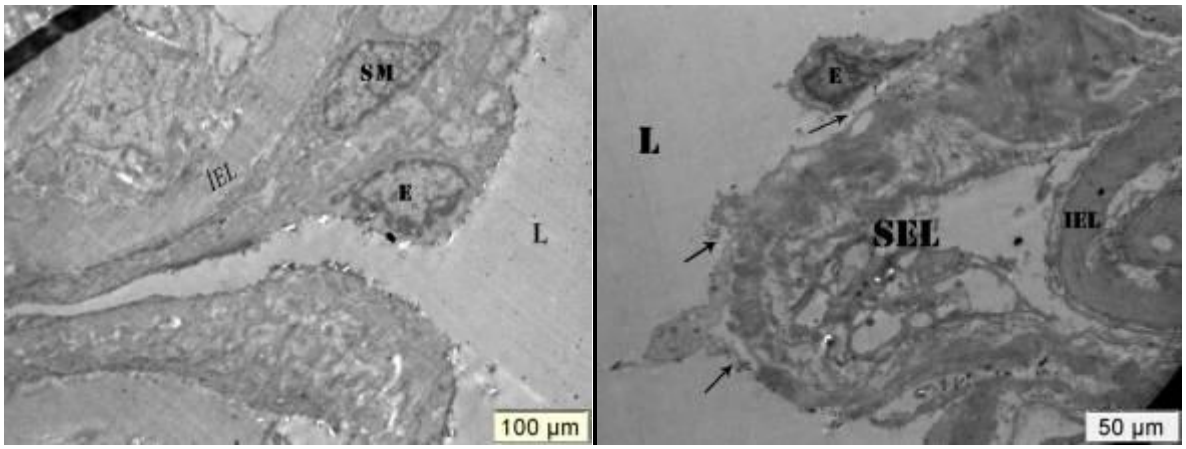


Figures 1a.) 1b.) In control group, luminal surface lined by normal limits of the original squamous epithelium(1a)x6000. The endothelial cell had a very distinct attachment to the basal membrane and cytoplasmic organelles were evident(1b)x10.000. Also, intercellular junctional complex were indicated(arrows). EF: Elastic fibril, CF: Collagen fibril



Figures 2a, 2b.Endothelial cells showed numerous cytoplasmatic vacuoles, also indicated nonvisible cytoplasmic organelles(2a)x2500.In luminal surface, contracted endothelial cells and splits were evident(arrows), also subendothelial layer showed disintegration(2b)x6000. E:Endothelial cell, L: Lumen, IEL: Internal elastic membrane, SM: smooth muscle cell, SEL: Subendothelial layer