Histopathological Differences of the Pedicle Artery in Commonly Used Free Flaps: The Influence of Age, Gender, and Side

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Purpose: The increasing use of vascularized free flaps has increased the demand for a specified flap selection. This study investigated histologic differences in the arterial wall of the pedicle for commonly used free flaps and the effect of age, gender, and anatomic side on these differences.

Materials and Methods: Light microscopic examinations of vessel walls were performed on 245 specimens of the nourishing artery of commonly used free vascularized flaps in preserved cadavers. The peroneal artery (PA), radial artery (RA), inferior epigastric artery (IEA), deep circumflex iliac artery (DCIA), and circumflex scapular artery (CSA) were examined. Differences of histologic changes in the arterial wall and the effect of age, gender, and body side were investigated.

Results: All examined vessel specimens (age range, 62 to 98 yr; mean age, 83 yr; 15 female and 12 male) displayed mostly Class II changes. PA showed the greatest atherosclerotic changes, followed by the RA, IEA, DCIA, and CSA. Age had a meaningful effect on PA and RA. Anatomic side was important for PA and DCIA, whereas gender had a minor influence on vessel condition.

Conclusion: The vessel wall of different flaps showed different atherosclerotic changes depending on age, anatomic side, and gender. These differences should be considered in flap selection.

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The evolution and advancement of microsurgical techniques in reconstructive surgery have improved functional and esthetic outcomes.[1-4] However, the demand for fewer complications related to this type of surgery is increasing. New donor sites and increased surgical indications have produced a confusing and bewildering array of reconstructive options.[5-7]

Despite greater experience, failure rates should not be disregarded.[8] Often, failure is the result of a multitude of factors. Occlusion of nourishing vessels from thrombosis is an important cause and has been reported to be as high as 10 to 12%.[9-13] Atherosclerosis and endothelial damage can cause arterial thrombosis.[14,15] Population demographics for patients presenting with head and neck cancers have documented mainly elderly patients with a history of smoking and drinking habits and comorbidities such as vascular disease, diabetes mellitus, and hypertension.[16] The combination of these factors can give rise to a higher incidence of atherosclerotic changes. Vessels from various regions

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of the body differ in atherosclerotic changes.[17,18] However, there is a lack of clear information on the degree of histopathologic changes of the vessel wall in the pedicle of different flaps.[19-21]

This study examined the condition of the arterial wall of commonly used free flaps for histologic changes and the impact of age, gender, and anatomic side. The authors' hypothesis was that vessels from different donor regions would show different atherosclerotic changes.

Materials and Methods

After institutional approval, 270 vascular specimens were obtained from the left and right body sides of 27 preserved human cadavers. Any specimens that were not adequately prepared were excluded from the study. The specimens were taken by 2 maxillofacial surgeons and examined by 1 pathologist and 1 histologist who were blinded to the origin of the specimen. The following vessels were included in the study: peroneal artery (PA), radial artery (RA), inferior epigastric artery (IEA), deep circumflex iliac artery (DCIA), and circumflex scapular artery (CSA). Samples were fixed in paraffin and sections were stained with hematoxylin for light microscopic examination. Atherosclerotic changes of the vessel wall were examined under a light microscope. The condition of the vessel wall was evaluated according to the method of Stary et al[22] and divided into the following modified classes:

- Class 0, no pathologic change.
- Class I, slightly thickened intima with the beginning of filament degeneration in the media (Fig 1).
- Class II, thickened intima and progressive filament degeneration in the media (Fig 2).
- Class III, calcification and progressive plaque development (Fig 3).
- Class IV, florid plaques and necrosis (Fig 4).

STATISTICAL ANALYSIS

Data from the examination of specimens and the results were collected in an Excel table (Microsoft, Redmond, WA) and statistically analyzed with SAS 9.2 (SAS Institute, Cary, NC) in Windows 7 (Microsoft). There was no readjustment for the α value. The Fisher exact test was applied and P values less than or equal to .05 were considered statistically significant. The predictor variable was type of artery (DCIA, IEA, RA, AA, and PA), and the outcome variable was vessel wall condition. Other variables included age, gender, and side.

Results

Of the 270 specimens 245 (age range, 62 to 98 yr; mean age, 83 yrs; 15 female and 12 male) were evaluated for histologic changes. Histologic examinations showed some degree of atherosclerotic changes in the vessel wall (Fig 5). The CSA showed the fewest Class IV changes and most changes were Class II followed by Class III (Table 1, Figs 6-8). Although not significant, the CSA displayed a better condition compared with the RA (P = .447) and PA (P = .203), which was similar to the DCIA (P = .675) and IEA (P = .818). The DCIA showed all stages of atherosclerotic changes, but

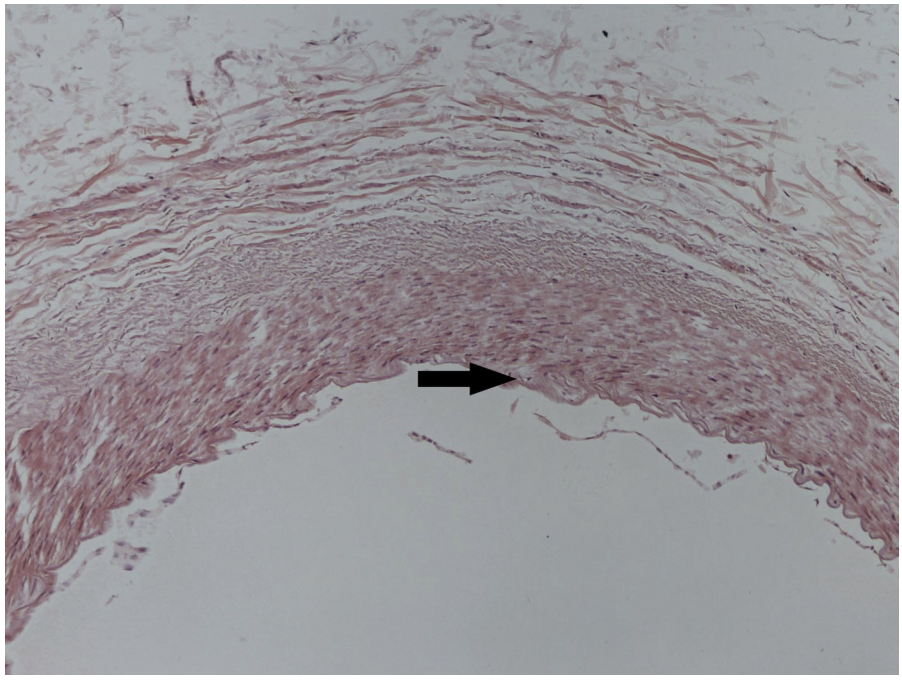

FIGURE 1. Light microscopic cross-section of the deep circumflex iliac artery with Class I changes (magnification, ×10). The slightly thickened intima (*arrow*) shows the initial degeneration of the filament in the media. The vascular condition of the vessel wall is still physiologic, with marginal changes in shape.

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