A Study on the Middle Transverse Palmar Arch: Preoperative Ultrasonography in Reverse Digital Artery Island Flap

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Abstract

Purposes: Fingertip injuries are the most common type in industrial accidents and daily life. A reverse digital artery island flap is often indicated in cases of severe contusions with large defects, such as complete finger pulp loss. The flap is maintained by a reversed flow in the proper palmar digital artery via the middle transverse palmar arch (MTPA) contralateral to the proper palmar digital artery. The interruption of the blood flow from MTPA results in the disruption of blood flow to the flap and its necrosis. Therefore, evaluating the presence of MTPA and its branching position is essential preoperatively. This study aimed to investigate the percentage of missing MTPA and its branching position in each finger.

Subjects and Methods: From May to September 2020, a total of 444 right and left index, middle, and ring fingers from 37 male and 37 female (mean age, 31±7.8 years) were enrolled in this study. The presence or absence of MTPA in each finger was confirmed by color Doppler ultrasound. The length of the middle phalanx (L1), the distance from the DIP joint to the branch of MTPA (D1), and the distance from the distal interphalangeal crease to the branch of MTPA (D2) were measured.

Results and Discussion: MTPA was detected in all 444 fingers. The mean values of D1 and D2 were 12.6±1.5 mm and 7.8±1.8 mm, respectively. The minimum and maximum ratios of D1 to L1 (D1 ratio) were 35.4% and 75.7%, respectively. The mean value in the index finger was 55.0±4.7%, which was significantly larger than the 51.5±4.1% in the middle finger and 50.5±4.9% in the ring finger ($p<0.001$). The minimum and maximum ratios of D2 to L1 (D2 ratio) were 16.8% and 51.1% respectively. The mean value in the index finger was 30.7±6.2%, which was significantly smaller than the 33.7±5.7% in the middle finger and 32.0±7.7% in the ring finger ($p=0.025$). There was also a little correlation between L1 and D1 ratios ($r=-0.13$, $p<0.01$) and L1 and D2 ratios ($r=0.12$, $p<0.01$).

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