SINGLE PEDICLE SUPERFICIAL INFERIOR EPIGASTRIC ARTERY FLAP VERSUS BIPEDICLE SUPERFICIAL INFERIOR EPIGASTRIC ARTERY AND SUPERFICIAL EXTERNAL PUDENDAL ARTERY FLAP: THE FLAP PERFUSION AND VIABILITY STUDY IN THE RABBIT MODEL

by

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ABBREVIATION

DIEP	: Deep inferior epigastric artery perforator
LDF	: Laser Doppler flowmetry
MS	: Muscle sparing
PU	: Perfusion unit
SEPA	: Superficial external pudendal artery
SEP	: Superficial external pudendal
SIEA	: Superficial inferior epigastric artery
SIE	: Superficial inferior epigastric
TRAM	: Transverse rectus abdominis myocutaneous
VRAM	: Vertical rectus abdominis myocutaneous

ABSTRAK

Di antara flap abdomen, flap arteri epigastrik inferior superfisial (SIEA) telah dikenal-pasti sebagai teknik yang paling kurang invasif disebabkan morbiditi yang minimum di bahagian tempat menderma. Flap ini biasanya dibedah sebagai flap separa-abdomen. Oleh kerana itu, perfusi dan keupayaan hidup pada flap SIEA yang menjangkau atas umbilikal memerlukan kajian yang mendalam dengan menggunakan model flap SIEA pada arnab. Kajian ini dikendalikan dengan tujuan untuk menentukan anatomi saluran darah pada abdomen ventral arnab, membentuk model flap SIEA pada arnab serta membuat perbandingan perfusi dan keupayaan hidup antara flap dengan satu pedikel dan flap dengan dwi-pedikel. Anatomi saluran darah dibedah untuk tujuan pemerhatian terus dan dokumentasi. Terdapat dua belas flap yang simetri, bersebelahan dengan dimensi 12x5cm dibedah pada abdomen ventral enam arnab putih New Zealand. Flap di sebelah kanan berdasarkan satu pedikel SIEA manakala flap di sebelah kiri berdasarkan dwi-pedikel SIEA dan arteri pudendal luaran superficial (SEPA). Perfusi flap ditentukan secara objektif dengan laser Doppler flowmetry (LDF) dan keupayaan hidup flap ditentukan dengan menggunakan luasan dua dimensi selama 14 hari selepas pembedahan. Saluran darah SIEA merupakan bekalan darah utama pada abdomen ventral arnab. Ia digabungkan dengan saluran darah SEPA pada proksimal pad lemak inguinal. Tiada saluran darah perforator cukup besar yang menembusi dari otot abdominis rektus atau otot abdomen lateral untuk membekal darah kepada kulit abdomen pada arnab untuk membentuk model flap perforator. LDF pada flap dwi-pedicle SIEA/SEPA adalah tinggi sedikit berbanding dengan

flap satu pedikel SIEA dari segi min keseluruhan (67.8±10.3 berbanding dengan 59.2±10.3 unit perfusi)dan dari semasa ke semasa selepas pembedahan dari hari pertama sehingga hari ke-14. Namun demikian, perbezaannya adalah tidak ketara secara statistik ($p>0.05$). Bacaan min LDF keseluruhan pada pertengahan flap adalah lebih tinggi dari hujung flap. Perbezaannya juga tidak ketara ($p=0.561$). Min keupayaan hidup pada flap dwi-pedicle adalah lebih baik daripada flap satu pedikel (99.6 ± 6.6 % berbanding dengan 90.6 ± 6.6 %). Walaubagaimanapun, perbezaan ini juga tidak ketara secara statistik ($p=0.361$). Bacaan LDF pada hari pertama dan ketiga selepas pembedahan berhubung kait dengan keupayaan hidup flap pada hari ke-7 and 14 ($p<0.05$). Sebagai kesimpulannya, model flap SIEA arnab boleh diibaratkan sebagai flap SIEA manusia yang menjangkau atas umbilikal. Pedikel tunggal SIEA dapat mencapai perfusi dan keupyaaan hidup yang memuaskan untuk kedua-dua kawasan vaskular SIEA and arteri thorasik lateral. Tiada perbezaan ketara dari segi perfusi and keupayaan hidup antara flap SIEA dengan satu pedikel atau dwi-pedikel.

ABSTRACT

Introduction: Among the abdominal flaps, the superficial inferior epigastric artery (SIEA) flap is recognized as the least invasive technique with minimal donor site morbidity. It is usually raised as hemi-abdominal flap. The perfusion and viability of the SIEA flap extending above the umbilicus require further exploration with the rabbit paramedian SIEA flap model.

Objectives: The present study was undertaken to determine the vascular anatomy of the rabbit ventral abdomen, to develop a rabbit SIEA flap model and to compare the flap perfusion and viability between the single and bipedicle flaps. The vascular anatomy was dissected for direct observation and documentation.

Methods: Twelve bilateral 12x5cm symmetrical paramedian flaps were raised on the ventral abdomen of six male New Zealand White rabbits. The right flaps were based single pedicle of SIEA whereas the left flaps were based on bipedicle of SIEA and superficial external pudendal artery (SEPA). The perfusion of flaps was objectively determined with laser Doppler flowmetry (LDF) and the flap viability was assessed with two-dimensional planimetry over 14-day duration postoperatively.

Results: The SIEA was the dominant vascular supply of the rabbit ventral abdomen. It was joined by the SEPA just proximal to the inguinal fat pad. There was no significant size muscular perforating vessel from the rectus abdominis or lateral abdominal muscles for establishing a perforator flap model. The LDF of the bipedicle SIEA/SEPA flap were marginally superior to single pedicle SIEA flap in overall mean (67.8±10.3 versus 59.2±10.3 perfusion units) and over time from postoperative day 1 to day 14 but the

differences were not statistically significant ($p>0.05$). The overall mean LDF reading at the centre of flap was higher than at distal flap (66.3±7.4 versus 60.7 ± 7.4 perfusion units) but the difference was not statistically different ($p=0.561$). The mean flap viability of the bipedicle SIEA/SEPA flap was better than the single pedicle SIEA flap (99.6± 6.6% versus 90.6±6.6%) but it was not statistically significant ($p=0.361$). The LDF measurements on post-operative day 1 and 3 moderately correlated with the outcome of flap viability on day 7 and 14 ($p<0.05$).

Conclusion: The paramedian rabbit SIEA flap model can be an analogue of the human SIEA hemi-abdominal flap that extends above the umbilicus. The single pedicle SIEA could achieve satisfactory perfusion and viability for both the ipsilateral vascular territories of the SIEA and lateral thoracic artery. There was no significant difference of flap perfusion and viability between single and bipedicle SIEA flaps.