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PUDENDAL THIGH FASCIOCUTANEOUS PERFORATOR FLAP FOR VAGINAL AND PERINEAL RECONSTRUCTION: OPTIMIZING FLAP SURVIVAL

Hypothesis / aims of study

Urogenital reconstructive techniques include perineal reconstruction, vaginoplasty, urethral reconstruction, and vesico-vaginal (VVF) and recto-vaginal fistula (RVF) repair. Many of these procedures require the use of local or distant flaps for reconstruction, of which the pudendal thigh fasciocutaneous perforator (PTF) flap is an option.

We frequently use this flap for perineal reconstruction, and VVF and RVF fistula repair. It is easy to harvest, sensate, less bulky than myocutaneous flaps, has an inconspicuous donor site scar and has the option of providing an epidermal layer (a major advantage over the Martius graft). However, flap survival rates are highly unpredictable with apical necrosis being widely reported.

The aim of this study was to conduct a detailed cadaveric dissection along with angiography to evaluate the perineal blood supply of the PTF flap. We also aimed to analyze why this graft is traditionally unreliable because of apical necrosis and to optimize the future successful use of the PTF flap.

Study design, materials and methods

Whole pelvis specimens from 5 unembalmed human cadavers were used, 3 females and 2 males. The internal pudendal, obturator and external pudendal arteries were selectively injected with lead oxide bilaterally in four specimens. One specimen underwent entire body arterial injection via the femoral arteries bilaterally. Dissection to remove the skin, subcutaneous tissue and pelvic floor muscles of the specimens en bloc was performed. PTF flaps were raised. Radiographs of each whole pelvis, skin and flap specimens were taken.

Results

This study demonstrated 3 separate vascular territories supplying the PTF flap. It is supplied sequentially from its base by the posterior labial/scrotal arteries, cutaneous branches from the anterior branch of the obturator artery, and anterior labial branches from the external pudendal arteries.

There were several midline anastomoses between branches of the inferior rectal arteries, the transverse perineal arteries and the posterior labial/scrotal arteries. Midline anastomoses between the external pudendal arteries were also noted. We also observed anastomoses between small-caliber vessels of the posterior labial/scrotal arteries and branches of the obturator artery as well as anastamoses between the anterior labial/scrotal arteries and the obturator artery. As a result, the urogenital triangle of the perineum is supplied by three vascular territories, and by default, so is the PTF flap, making it a three-territory flap.

Another feature demonstrated by this study was the benefit of imaging the vessels supplying the flap to demonstrate variations in its vascular territories. While direct angiography was used on these specimens, the invasiveness of this technique makes its clinical use less than ideal. Doppler and duplex ultrasound, computer tomography (CT) angiography and magnetic resonance angiography (MRA) provide less invasive imaging techniques. These techniques may be useful for pre-operative visualization of the vascular territories in the PTF flap, in order to optimize graft survival.

Interpretation of results

Our results provided a more accurate description of the relationship of perineal blood supply to the PTF flap than has previously been reported. The anatomical information obtained from this study regarding the arterial supply to the perineal integument provided several explanations as to why the PTF flap has been unreliable. The presence of a third vascular territory (supplied by the external pudendal artery) at the tip of the PTF flap leaves it vulnerable to apical necrosis. Its sequential blood supply by three vessels from its base by the posterior labial or scrotal arteries, cutaneous branches from the anterior branch of the obturator artery, and anterior labial/scrotal branches from the external pudendal arteries is the major factor contributing to vulnerability of the PTF flap.

In order to improve the reliability of blood supply to the PTF flap and to prevent apical necrosis, modifications to the operative technique are recommended. These would include delay techniques to augment the blood supply to the PTF flap, or modifications to the flap design.

As well as providing insight into how to improve the reliability of the PTF flap, our results provided insights into how to improve the flap characteristics to optimize its benefits. Our findings are also likely to be relevant to the Martius graft.

Concluding message

The PTF flap is a useful graft to augment urogenital reconstruction. While traditional procedures have resulted in partial flap necrosis rates as high as 63%, the current study highlights an anatomical basis for this. Our study indicated that delay techniques to augment the blood supply to the PTF flap were warranted to improve flap reliability and survival of the third vascular territory. Pre-operative imaging techniques may help optimize surgical outcome by providing a guide to the vascular territories and facilitate modifications to flap design.

References

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