**AXIAL PATTERN FLAPS**

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**Introduction**

Axial pattern flaps are pedicle grafts which incorporate a direct cutaneous artery and vein into the base of the flap. Major tributaries of these vessels run the length of the flap to a variable degree. Inclusion of direct cutaneous arteries allow the surgeon to create flaps of greater dimensions compared to skin flaps based on the subdermal plexus circulation.

It is not necessary, nor is it possible, to include a direct cutaneous artery (and vein) into every flap created. The axial pattern flaps designed for veterinary use have been mapped over known major direct cutaneous vessels, utilizing regional anatomic landmarks. Effective use of a given axial pattern flap will depend on the size and location of the defect in relation to a given pedicle graft’s arc of rotation. The vessels must be preserved for complete flap survival: occlusion of the artery and vein will result in an average loss of 50% of a given axial pattern flap.

Axial pattern flaps generally are used to close larger wounds in the head, neck, trunk, and upper to mid-extremity regions. In cats, and smaller dogs with comparatively short legs in proportion to the trunk length, the thoracodorsal and caudal superficial epigastric flaps can extend to the distal areas of the limbs.

Prior to the use of an axial pattern flap, the surgeon should consider alternative techniques that may be technically easier to perform that can achieve the desired functional results. The most useful alternative techniques include the use of local flaps, skin stretchers, skin grafts, and myocutaneous flaps. Careful assessment of the wound will help determine if closure can be achieved by the natural healing processes of wound contraction and epithelialization.

**Axial Pattern Flap Selection**

Adjacent axial pattern flaps can overlap potential wound closure areas, with one another, in their potential coverage of a given defect. For example, upper forelimb/axillary defects may be covered by the thoracodorsal or omocervical axial pattern flap. Selection of a given flap will depend on personal preference of the surgeon, ease of transfer, and the relative flap size required. In this example, the thoracodorsal flap has a superior blood supply, thus enabling the surgeon to elevate a longer flap with less potential for partial flap necrosis for larger regional defects in these regions.
Surgical Considerations

Preservation of the artery and vein are critical to successful flap execution. This would include avoiding twisting or kinking of the vascular pedicle during flap transfer. Guidelines for flap elevation noted in the literature are no guarantee of complete flap survival; necrosis of small portions of the terminal flap occasionally is noted. These areas can be resected and the defect closed by advancement of the flap. Otherwise, small areas may be left open to heal by second intention.

Axial Pattern Flaps: Potential Uses

- Omocervical: Head, neck, shoulder, axilla
- Thoracodorsal: Neck, thorax, axilla, forelimb
- Caudal Superficial Epigastric: Hindlimb, flank, abdomen, perineum
- Cranial Superficial Epigastric: Sternum, lower thoracic region.
- Deep Circumflex Iliac (dorsal branch): lateral abdominal, dorsal/lat pelvis, gr. Trochanter
- Deep Circumflex Iliac (ventral branch): inguinal, dorsal pelvic regions
- Superficial Brachial: Proximal forelimb, elbow area
- Genicular: Lateral/medial Prox-/mid-tibial region
- Reverse Saphenous Conduit Flap: metatarsal area
- Caudal Auricular: Facial area, head, ear
- Lateral Caudal (Tail): Perineum, dorsal pelvic area

Surgeons must carefully follow the guidelines, described in the veterinary literature, for elevation and transfer of a given axial pattern flap. Improper outlining of the flap can result in failure to incorporate the direct cutaneous artery and vein into the flap. Previous trauma can result in compromise to these vessels and the associated capillary circulation, rendering axial pattern flap elevation useless.

Greyhounds, whippets and similar breeds possessing thin, “tight” skin are more prone to partial flap necrosis compared to other breeds. It is useful to keep a given axial pattern flap about 25% shorter than the guidelines noted in the literature, based on my clinical experience. In general, it is a good idea to keep all flaps as short as needed to close a given wound and restore function to the area: this reduces the likelihood of flap necrosis.

Axial pattern flaps can be designed in the conventional “peninsula” shape or elevated as a right angle or “hockey-stick” variation. Peninsula APFs are longer than the latter: right angle APFs can be useful to close shorter, wider defects or irregular shaped wounds. Island arterial flaps generally are not need in most cases. It is my experience that island APFs are most useful when closing defects that encroach on the base of a proposed flap, with the adjacent direct cutaneous artery and vein enabling the flap to pivot 180° into the defect.
References

