

Difficult wound closure
—
what works best for me

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Synevovet – Symposium
Bucharest, October 25th, 2013

Tumour resections

Traumatic skin loss
Shearing injuries
Burns

Skin loss after infection

Failed wound closure
+/- Automutilation

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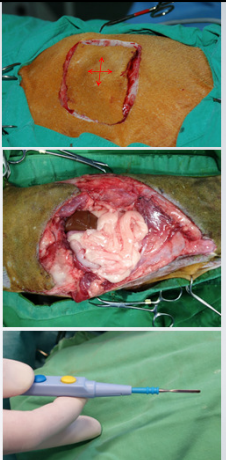


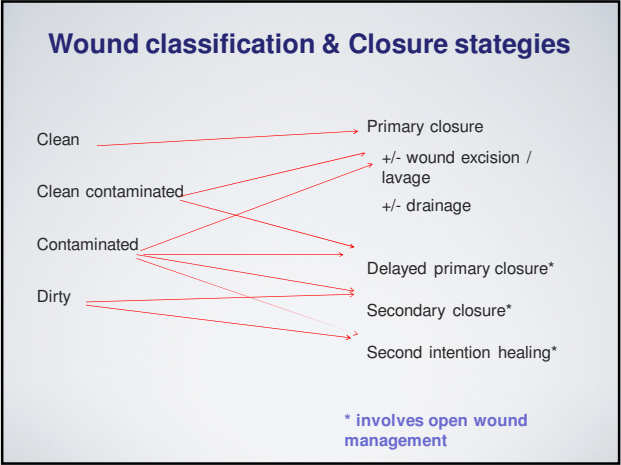
Tumour resections

wide & clean margins
depending on tumour type
towards all directions

resection governed by removal, not
closure


if available, use high frequency
scalpel





6 key points of wound management

- Prevent further wound contamination
- Debride dead and dying tissue
- Remove foreign debris and contaminants
- Provide adequate wound drainage
- Establish a viable vascular bed
- Select the appropriate method of closure



Pavletic, 2010: Atlas of Small Animal Wound Management & Reconstructive Surgery

Open wound management

whenever you feel doubt about

- contamination
- vascularity
- tension

leave it open!



Yorkshire Terrier, dehiscence after bite wound & rib fractures

Open wound management

lavage & debridement

surgical (scalpel & sharp scissors)

wet-to-dry bandages

enzymatic debridement



1,6 mm cannula



Open wound management

supporting granulation tissue

paraffin or petrolatum jelly

+/- topical antibiotics

(alginates)

hydrogel



Skin closure techniques

Avoid unnecessary efforts!


Closure by stretching of skin

Tension relieving techniques

Local skin flaps

Axial pattern flaps

Free skin graft



complication rate ▢

Skin closure techniques

Provide adequate drainage!

absorbent primary + secondary layer in open wound management

Penrose drain

active suction drain

advanced vacuum systems

Absorbent bandage layers

primary + secondary layer in open wound management must absorb fluid!

secondary layer: synthetic material superior to cotton or cellulose



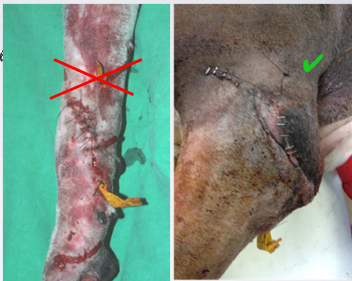
Penrose drain

inexpensive, well tolerated

deep exit point

hide proximal end

protect by bandage



Active suction systems

Self-made: tubing and syringe

Jackson-Pratt system (Infinity®)



Advanced vacuum systems

continuous vacuum provided by pump

air-tight drape holds foam in wound bed

extremely efficient, expensive



Definitive wound closure



?



?



tension in suture line ☐ dehiscence

How to avoid in larger wounds?

thoughtful positioning avoids tension

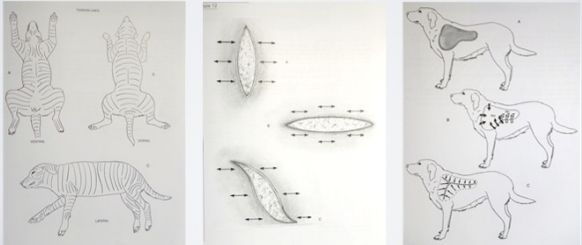


tension in suture line ☐ dehiscence

How to avoid in larger wounds?

cut parallel to tension lines

test skin availability by lifting folds



Pavletic, 2010: Atlas of Small Animal Wound Management & Reconstruction

tension in suture line ☐ dehiscence

How to avoid in larger wounds?

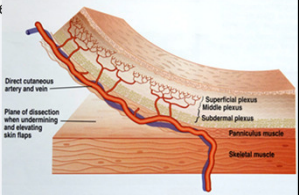
undermine adjacent skin

only as much as necessary – dead space !

under panniculus muscle

middle & distal extremity: over fascia

preserve direct cutaneous arteries

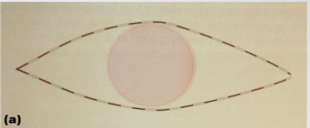


Williams, Moores, 2009:
BSVA Manual of Canine and Feline
Wound Management and Reconstruction

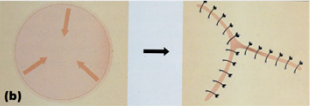
tension in suture line ☐ **dehiscence**

How to avoid in larger wounds?

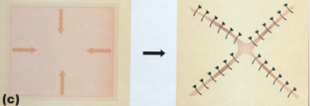
manipulate wound geometry



(a)



(b)



(c)

Williams, Moores, 2009:
BSVA Manual of Canine and Feline Wound Management and Reconstruction

tension in suture line ☐ **dehiscence**



d 10

Rhodesian Ridgeback, m, 8 ys, haemangiopericytoma

tension in suture line ☐ **dehiscence**

How to avoid in larger wounds?

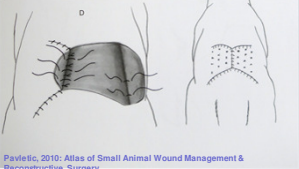
Release incisions



tension in suture line ☐ dehiscence

How to avoid in larger wounds?

- careful suturing of subcutaneous tissue



Paylefic, 2010; Atlas of Small Animal Wound Management & Reconstructive Surgery

- walking sutures
 - approximate skin edges
 - close dead space
 - Attention: can compromise perfusion!

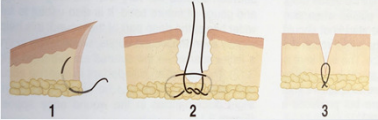
tension in suture line ☐ dehiscence

How to avoid in larger wounds?

careful suturing of subcutaneous tissue

subdermal sutures

- less tension on skin
- bury knot deep in wound



Williams, Moores, 2009; BSAVA Manual of Canine and Feline Wound Management and Reconstruction


tension in suture line ☐ dehiscence

How to avoid in larger wounds?


use tension suture pattern

far-far-near-near

retention sutures



Williams, Moores, 2009; BSAVA Manual of Canine and Feline Wound Management and Reconstruction



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Use optimal equipment for optimal success

- Atraumatic instruments
 - Adson-Brown thumb forceps
 - Debaquey's thumb forceps
 - Skin hooks, towel clamps or stay sutures
- Atraumatic suture material
 - preferably monofilament
 - e.g. Monosyn®, Monocryl®, Nylon®



Advanced wound closure techniques

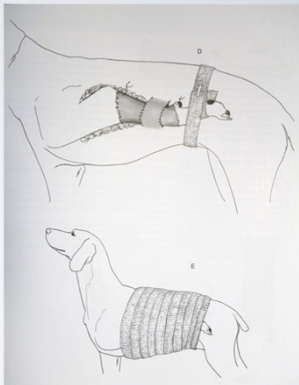
Skin Flaps: **perfusion is provided by subdermal plexus**

Axial pattern flaps: **perfusion is provided by specific arteries**

Skin grafts: **perfusion is provided by ingrowing vessels**

Skin flaps

- Local flaps
- Advancement flap
 - Transposition flap
 - Rotation flap
- Distant flaps
- bridge intact area of skin
 - Pocket flap
 - Tubular flap



Pavletic, 2010: Atlas of Small Animal Wound Management & Reconstructive Surgery

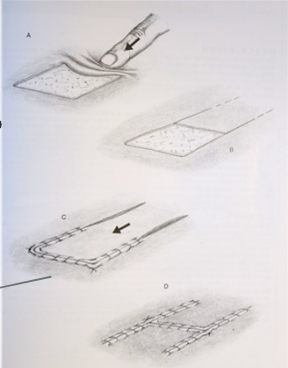
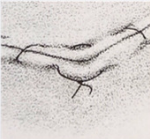
Advancement flap

Needs loose skin near to wound

Can dehisc due to wound contraction




Single or bipedicle technique

H-plasty



Pavletic, 2010: Atlas of Small Animal Wound Management & Reconstructive Surgery

Advancement flap

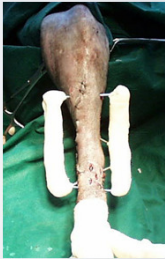





ESH, Mn, 1 y, wound since 3 weeks

d 4

Advancement flap

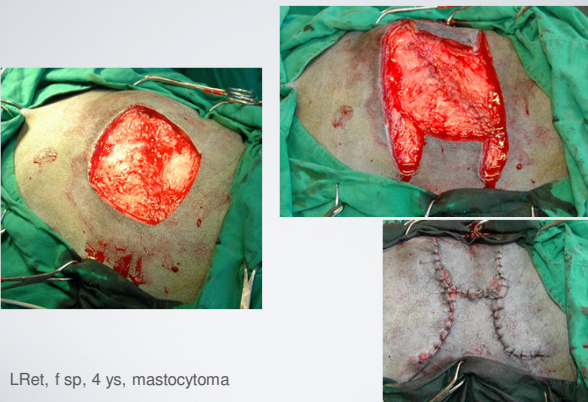
+ local skin stretching



ESH, f sp, 3 ys, hit by car

d 7

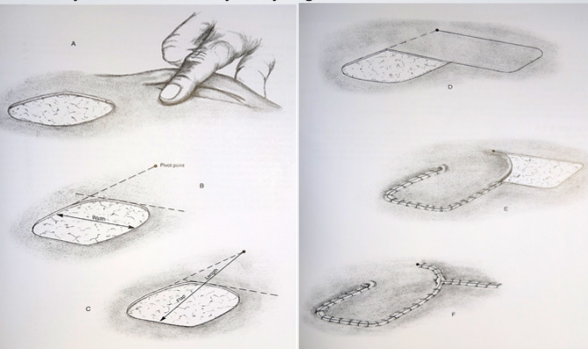
H-plasty



LRet, f sp, 4 ys, mastocytoma

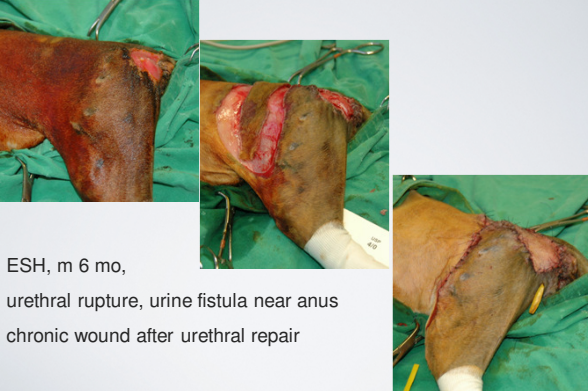
Transposition flap

Extremely versatile in many body regions



Pavletic, 2010: Atlas of Small Animal Wound Management & Reconstructive Surgery

Transposition flap

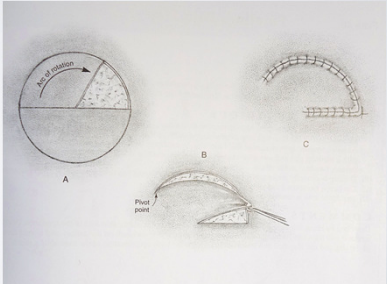


ESH, m 6 mo,
urethral rupture, urine fistula near anus
chronic wound after urethral repair

Rotational flap


combines transposition and skin stretching

undermine stepwise and pull into defect



Pavletic, 2010: Atlas of Small Animal Wound Management & Reconstructive Surgery


Rotational flap



Husky Mix, m, 5 ys infected bite wound

dehiscence after first closure by

Rotational flap



Husky Mix, m, 5 ys infected bite wound

Rotational flap

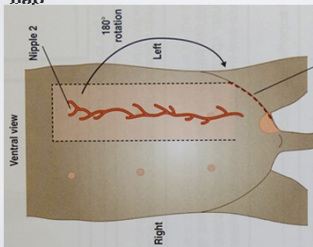


Husky Mix, m, 5 ys infected bite wound

Axial pattern flaps

Perfusion is provided by specific arteries

Caudal superficial epigastric axial pattern
flap



Drawings: Williams, Moores, 2009: BSAVA Manual of Canine and Feline Wound Management and Reconstruction

Axial pattern flaps

Perfusion is provided by specific arteries

Caudal superficial epigastric axial pattern
flap

Thoracodorsalis axial pattern flap

Deep circumflex iliac axial pattern flap



Drawings: Williams, Moores, 2009: BSAVA Manual of Canine and Feline Wound Management and Reconstruction




Thoracodorsal axial pattern flap

based on cutaneous branch of thoracodorsal artery

robust flap

can cover elbow in dog

can cover forelimb down to carpus in cats





Mix, m, 10 ys, soft tissue sarcoma

Caudal superficial epigastric axial pattern flap

based on inguinal vessels

wide arc of rotation

ovarectomy in females






Mix, m, 11 ys, putrid furunculosis

Caudal superficial epigastric axial pattern flap

based on inguinal vessels

wide arc of rotation



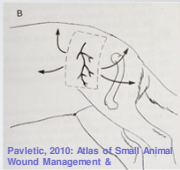
Mix, m, 11 ys, putrid furunculosis

d 21


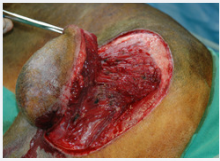

Deep circumflex iliac axial pattern flap

dorsal and ventral branch for individual flaps

mainly for covering defects in pelvic /thigh



Pavletic, 2010: Atlas of Small Animal Wound Management & Reconstructive Surgery



Mix, m, 12 ys, haemangiopericytoma

Free skin grafts

Perfusion is provided by ingrowing capillaries

Split thickness graft

- harvested by dermatome
- heal in quicker
- less durable, less hair growth

Full thickness graft

- „scalpel mesh graft“
- more practical in veterinary medicine
- most useful in distal extremity defects



Pavletic, 2010: Atlas of Small Animal Wound Management &

Free skin grafts

Scalpel mesh graft

donor site: good to close

plan size and direction of hair growth

remove all subdermal fat

mesh with #15 scalpel

suture over granulation bed

slightly overlap wound edges



Free skin grafts

Scalpel mesh graft

non-adherend bandage w AB ointment

conforming and immobilizing secondary

additional stabilisation if necessary

first bandage change after 3 days

protect for apprx. 4 weeks from licking



Free skin grafts

„Taking“ of free skin grafts

cats > dogs

superficial necrosis not always a disaster

subdermal structures often survive



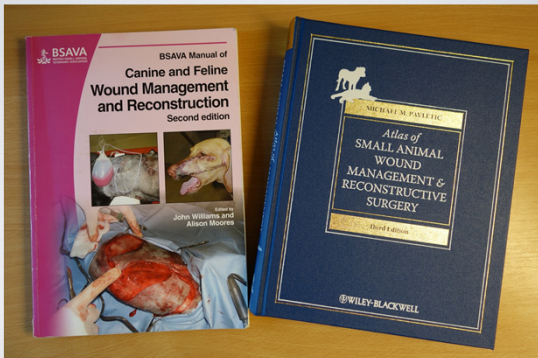
Irish Setter, m, 7 ys, chronic licking granuloma

Take home messages

- Adhere strictly to atraumatic wound management and drainage techniques
- Close only clean wounds with viable wound beds
 - prolonged open wound management pays back in lesser complications
 - allow healthy granulation tissue stay deep in wound, excise only wound edges

Take home messages

- Use skin stretching techniques as long as tension allows
- Advance to skin flap techniques when necessary
- Use axial pattern flaps and grafts only when inevitable



ESH, f sp, 1 y, heat damage after enterotomy



presented 3 weeks after surgery




ESH, f sp, 1 y, heat damage after enterotomy




after 10 days p.o. antibiotics



ESH, f sp, 1 y, heat damage after enterotomy



7days later...



ESH, f sp, 1 y, heat damage after enterotomy



again 7days later...



