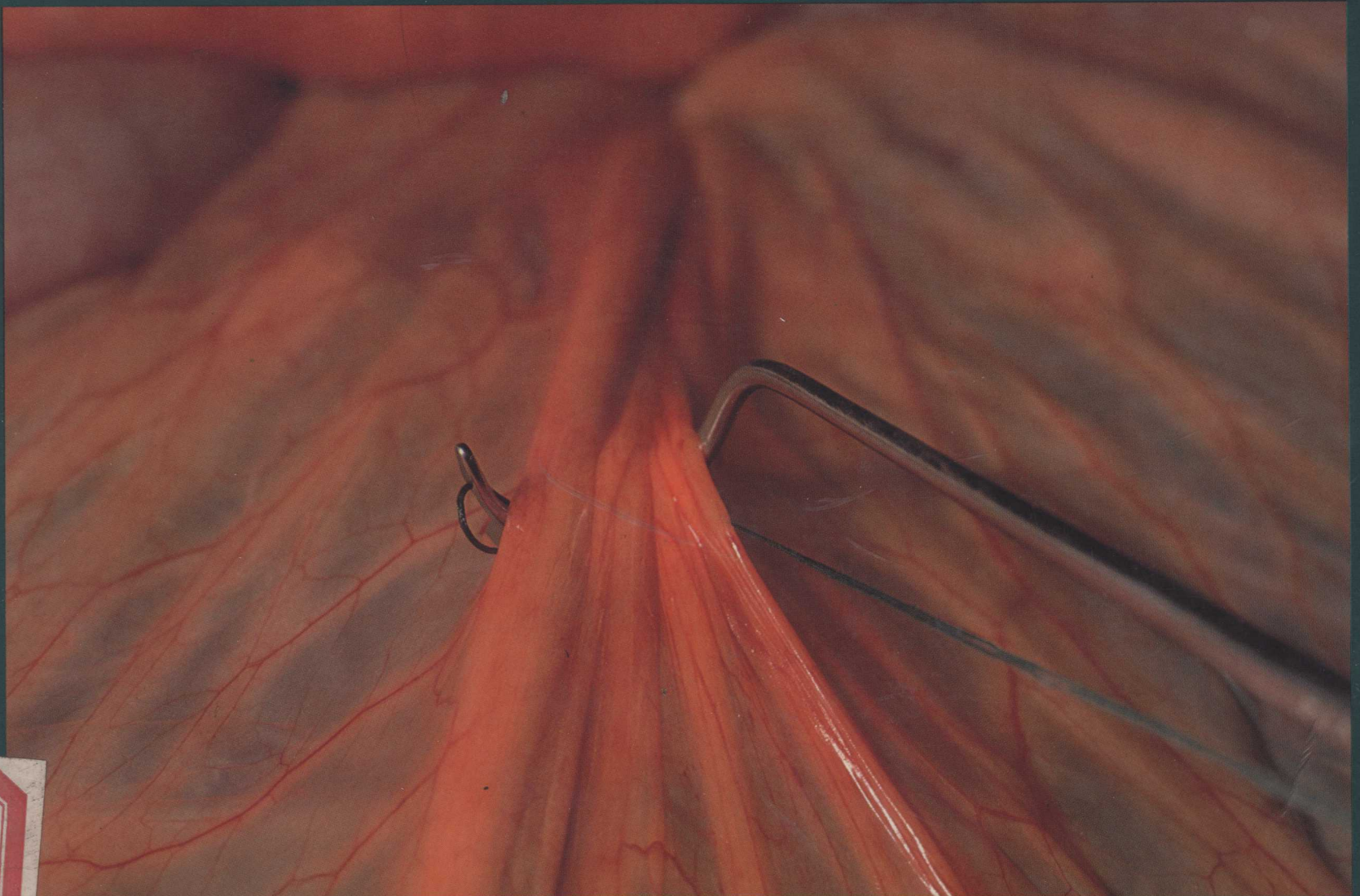


Atlas of large animal surgery

edited by

A. W. Kersjes, F. Németh and L. J. E. Rutgers

Williams & Wilkins



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A. W. Kersjes, F. Németh and L. J. E. Rutgers

in collaboration with

E. C. Firth, P. Fontijne and M. A. van der Velden

Photography F. A. Blok



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Preface

A thorough anatomical and pathophysiological knowledge of the condition and meticulous attention to surgical principles are the basis for all surgical procedures. Assuming these requirements are fulfilled, surgery is by its very nature a discipline which should be visualized. Modern visual aids are therefore playing an increasingly important role in the instruction of surgical techniques. This does not mean that textbooks will become redundant, but there is a trend toward more illustrations and less text, a tendency which underlies the preparation and publishing of this atlas.

The authors are of the opinion that it will be elucidating to students and veterinary surgeons to have available a full colour photographic atlas of the treatment of the most important surgical conditions. We have attempted to show the essential steps of each procedure, accompanied by pertinent but limited text. It often has been a challenge to find a balance between text and photographs and at the same time to meet the requirements of adequate description, within the limitations of the concept of this atlas.

This publication does not aim at replacing a textbook, and thus chapters on general surgical principles have been omitted. It is therefore assumed that the reader has knowledge of current concepts of, for instance, asepsis and antisepsis, instrumentation, suture materials and techniques, wound healing, principles of fracture repair, and supportive measures (fluid therapy, role of antibiotics, anti-inflammatory drugs etc.).

The surgical techniques are in most cases time-honoured and are used in the Department of General and Large Animal Surgery and the Department of Obstetrics, Gynaecology and A.I. at Utrecht. The majority of the presented techniques, especially those concerning the bovine species and other food animals, can be carried out in general practice. However, a number of advanced techniques which can not be performed without hospital facilities are included.

The editors are grateful to Prof. Dr. K. J. Dik and A. van der Woude, Department of Veterinary Radiology, for providing the radiographs. Realization of the book would not have been possible without help from fellow members of the Departments of General and Large Animal Surgery and Veterinary Anaesthesiology, particularly Dr. A. Barneveld, G. E. Bras, W. R. Klein and H. W. Merkens, who performed some of the depicted surgery. We also extend our thanks to Mrs. J. Th. Abels-van der Linden for typing the manuscript.

A. W. Kersjes
F. Németh
L. J. E. Rutgers

Contents

PREFACE

CHAPTER 1 THE HEAD 1

Poll

- 1-1 Disbudding and dehorning 2,3

Ear

- 1-2 Extirpation of aural fistula 4,5

Guttural pouch

- 1-3 Drainage and fenestration 6

Face

- 1-4 Trephination of the frontal sinus in cattle 7
1-5 Trephination of maxillary sinuses and repulsion of teeth in the horse 8,9

Mandible

- 1-6 Treatment of premaxilla and mandibular body fractures 10
1-7 Treatment of mandibular interdental space fracture 11

Mouth

- 1-8 Lingual mucosa resection in cattle 12

Eye

- 1-9 Suturing of eyelid laceration 13
1-10 Excision of the nictitating membrane 14
1-11 Enucleation of the eyeball 14,15

Nose

- 1-12 Treatment of nasolacrimal orifice atresia 16

CHAPTER 2 THE NECK 17

Muscles

- 2-1 Myectomy (Forssell) and accessory nerve neurectomy 18,19

Larynx and trachea

- 2-2 Laryngotomy - cricoarytenoidopexy and ventriculectomy 20,21
2-3 Laryngotomy - extirpation of subepiglottal cyst 22
2-4 Laryngotomy - in bovine necrotic laryngitis 23
2-5 Tracheotomy 24

CHAPTER 3 THE THORAX 25

- 3-1 Diaphragmatic herniorrhaphy 26,27
3-2 Treatment of fistulous withers 28

CHAPTER 4 THE ABDOMEN

Abdominal wall

- 4-1 Umbilical herniorrhaphy 30,31
4-2 Resection of urachal fistula 32,33
4-3 Ventral midline laparotomy 34,35
4-4 Flank laparotomy 36,37
4-5 Paramedian laparotomy 38

Gastro-intestinal system

- 4-6 Rumenotomy 39
4-7 Correction of left displaced abomasum 40,41
4-8 Correction of right displaced abomasum 42
4-9 Caecotomy in cattle 43
4-10 Enterectomy; side-to-side anastomosis 44,45
4-11 Enterectomy; end-to-end anastomosis 46
4-12 Jejunocaecostomy; end-to-side anastomosis 47
4-13 Correction of rectum prolapse 48,49
4-14 Treatment of atresia ani (et recti) 50

CHAPTER 5 THE UROGENITAL SYSTEM 51

The male urogenital system

- 5-1 Castration: open technique in the pig 52
5-2 Castration: closed technique in the goat 53
5-3 Castration: half closed technique in the horse 54,55
5-4 Castration: primary closure method in the horse 56,57
5-5 Vasectomy 57
5-6 Inguinal cryptorchidectomy in the horse 58,59
5-7 Abdominal cryptorchidectomy in the horse 60,61
5-8 Abdominal cryptorchidectomy: flank approach in the pig 61
5-9 Inguinal herniorrhaphy in the pig 62,63
5-10 Treatment of incarcerated inguinal hernia in the horse 64
5-11 Inguinal herniorrhaphy in foals 65

- 5-12 Management of evisceration after castration in the horse 66
- 5-13 Cystorrhaphy 67
- 5-14 Pararectal cystotomy 68
- 5-15 Urethrotomy 69
- 5-16 Removal of neoplasms of the bovine penis 70
- 5-17 Amputation of the equine penis 71
- 5-18 Circumcision (reefing) of the equine penis 72, 73
- 5-19 Retention suturing of the equine preputial orifice 73
- 5-20 Penis retraction operation in the horse 74, 75

The female urogenital system

- 5-21 Caesarean section in cattle 76, 77
- 5-22 Vestibuloplasty 78, 79
- 5-23 Perineal reconstruction after third degree laceration 80, 81
- 5-24 Episiotomy 82
- 5-25 Ovariectomy 82

CHAPTER 6 THE COMMON INTEGUMENT 83

Skin

- 6-1 Skin grafting 84, 85
- 6-2 Cryosurgery of sarcoids 86
- 6-3 Extirpation of acquired carpal bursa 87

Equine hoof

- 6-4 Treatment of pododermatitis 88
- 6-5 Extirpation of keratoma 88, 89
- 6-6 Management of penetrating wounds of the sole 90, 91
- 6-7 Treatment of canker 92
- 6-8 Treatment of thrush 93
- 6-9 Treatment of sand crack 93

Bovine digit

- 6-10 Treatment of pododermatitis 94
- 6-11 Treatment of heel abscess 95
- 6-12 Resection of the distal interphalangeal joint and navicular bone 96, 97
- 6-13 Amputation of digit 98
- 6-14 Resection of digital flexor tendons and digital synovial sheath 99

Mammary gland

- 6-15 Repair of teat lacerations 100
- 6-16 Repair of traumatic teat fistula 101
- 6-17 Management of congenital teat fistula 102
- 6-18 Management of teat obstructions 103
- 6-19 Amputation of the mammary gland 104

CHAPTER 7 THE MUSCULOSKELETAL SYSTEM 105

Muscles and tendons

- 7-1 Desmotomy of inferior check ligament 106
- 7-2 Desmotomy of medial patellar ligament 107
- 7-3 Sectioning of fetlock annular ligament 108
- 7-4 Tendon repair - carbon fibre implantation 109
- 7-5 Tibial neurectomy in spastic paresis 110, 111
- 7-6 Coccygeal myotomy 112
- 7-7 Amputation of the tail 113

Elbow

- 7-8 Plate osteosynthesis of ulna fracture 114, 115

Carpus

- 7-9 Arthrotomy in carpal bone fracture 116
- 7-10 Correction of valgus deviation 117

Femur

- 7-11 Plate osteosynthesis of supracondylar fracture 118, 119

Tibia

- 7-12 Plate osteosynthesis 120

Tarsus

- 7-13 Arthrotomy in osteochondrosis 121
- 7-14 Arthrodesis of the distal intertarsal joint in the horse 122, 123
- 7-15 Arthrotomy and curettage in septic bovine spavin 124

Metacarpus and metatarsus

- 7-16 Resection of fractured splint bone 125
- 7-17 Fracture treatment by the walking cast technique 126, 127
- 7-18 Sequestrectomy 128

Fetlock and phalanges

- 7-19 Osteotomy of apical fracture of proximal sesamoid bone 129
- 7-20 Treatment of first phalanx fractures 130, 131
- 7-21 Arthrotomy of fetlock joint in chip fracture 132
- 7-22 Treatment of third phalanx fracture in the horse 133
- 7-23 Lag screw fixation of navicular bone fracture 134, 135
- 7-24 Posterior digital neurectomy 136

BOOK REFERENCES 138

INDEX 139

Chapter 1 The head

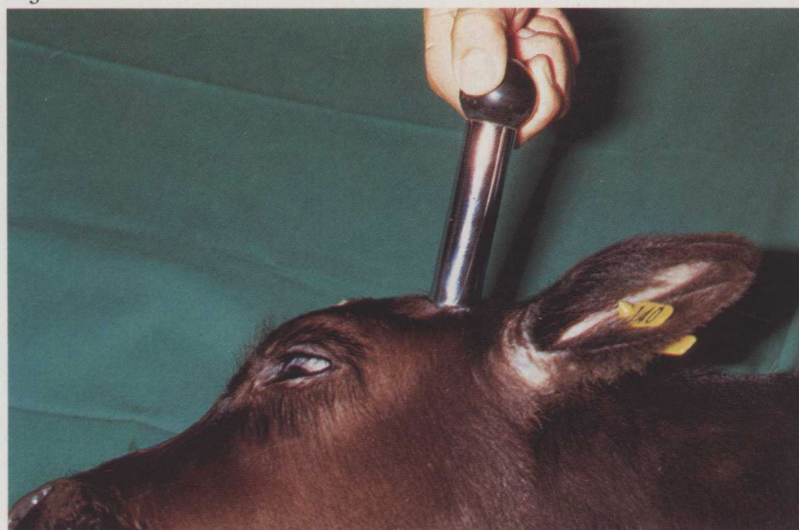
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1-1 Disbudding and dehorning

Dehorning of cattle is necessary as soon as the herd is being kept in a loose-housing system. The animals are no longer able to gore each other and become much quieter. As dehorning of adult cattle may be fatiguing for the operator and the procedure may give rise to complications (e.g. sinusitis), disbudding of calves is preferable. Occasionally amputation of the horn is indicated for other reasons e.g. fracture of the bony core of the horn.

Surgery.

(1) Disbudding. Several methods are practised.

a The use of caustics should be discouraged as it may cause too little or too much tissue damage.

b The best method is removing the buds with a disbudding iron under local analgesia (cornual nerve block). The hot iron is rotated as it burns through the skin surrounding the bud [001]. The iron is then tilted, enabling the bud to be scooped out [002]. This method is recommended because

haemorrhage does not occur and healing takes place within a few weeks leaving little or no scar.

c Surgical excision may be performed with Robert's dehorning trephine under local analgesia. The skin around the bud is incised by rotating the trephine [003], and although the instrument is designed for scooping out the bud, removal with forceps and scissors may be easier [004]. The wound produced is relatively large, and some haemorrhage is always present.

(2) Dehorning. If horn growth is already present some kind of surgical amputation must be performed. Several instruments are available for this purpose (saws, shears, wire). Adult cattle, restrained physically and chemically, are dehorned standing, and surgery must be carried out under local analgesia. If regeneration of horn is to be avoided the amputation should include 1 cm of skin around the base of the horn.

Young cattle can effectively be dehorned with one of the smaller amputation devices (e.g. Barnes' dehorner [005]). For older animals, embryotomy wire is very suitable as it offers the greatest opportunity to con-

005



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control the direction of the 'incision' [006]. As sawing is begun the wire is held in place at the horn base with a metallic object (e.g. scissors) to prevent the wire moving from the intended incision site. The sawing often generates sufficient heat to minimize haemorrhage [007]. If significant bleeding occurs haemostasis is best achieved with a point firing iron. Pneumatization of the bony core in animals over 6 months of age means that dehorning results in an open frontal sinus [007].

Dehorning of goats is occasionally requested. The different innervation should be noted: cornual branches of both lacrimal and infratrochlear nerves must be blocked. Suitable instruments include dehorning saw or embryotomy wire [008]. Amputation in adult goats should be considered carefully, because very large openings to the frontal sinuses result, necessitating prolonged aftercare.

Complications following dehorning of adult cattle are rare. Because secondary haemorrhage may develop after fighting or rubbing the wound, a dehorned herd should be inspected regularly during the first half day post-

operatively. Sinusitis may also occur due to the opening of the frontal sinus. If the sinusitis becomes purulent, trephination may be indicated (see 1-4).

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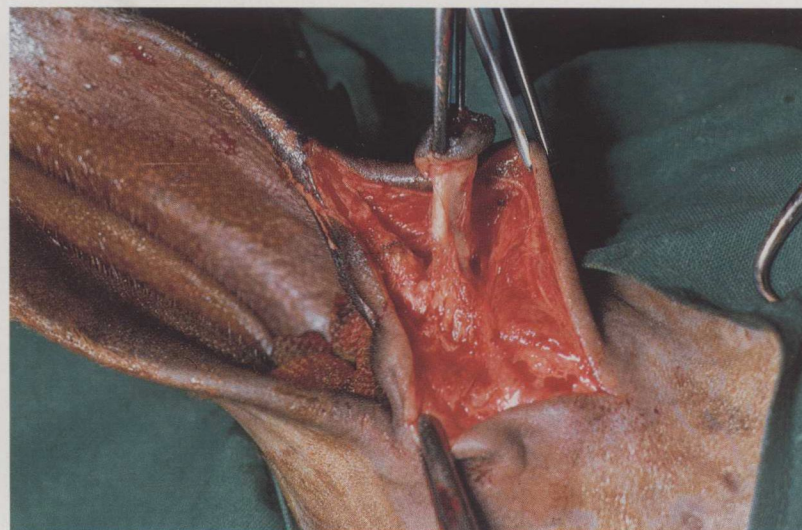
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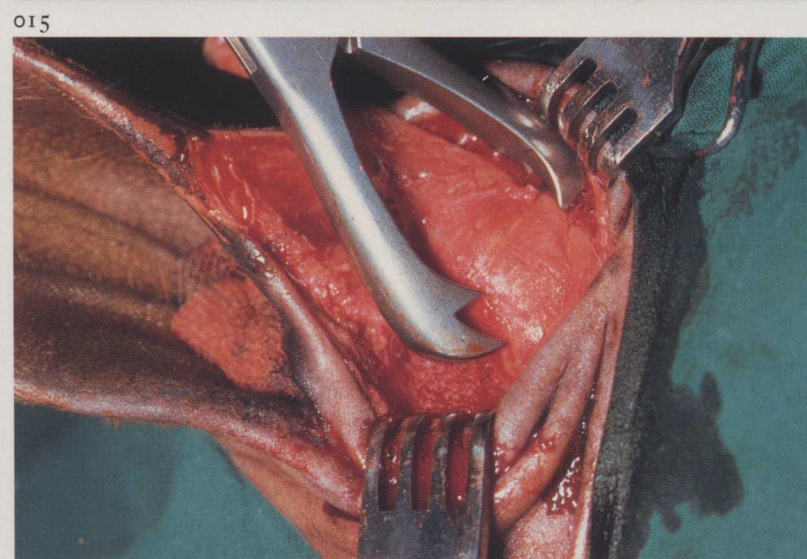
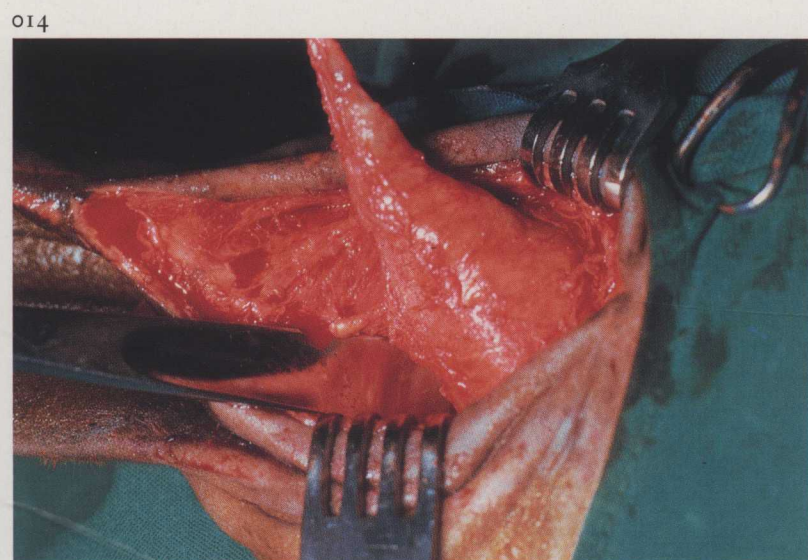
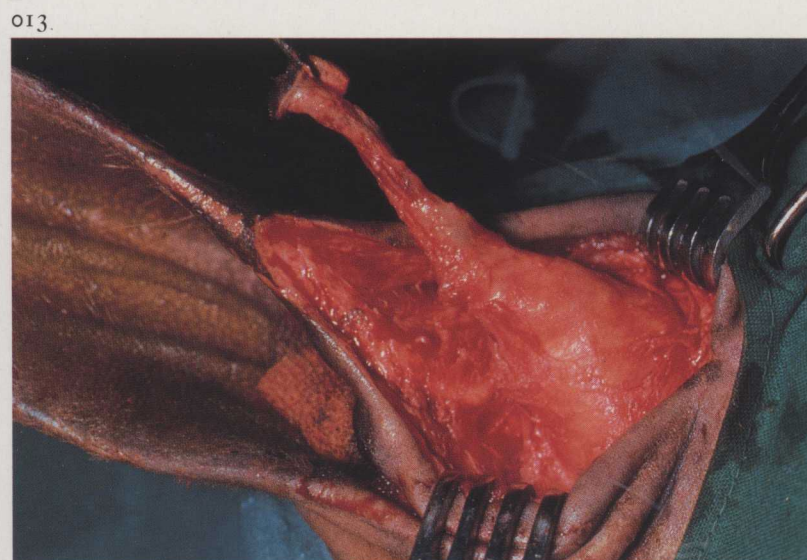


1-2 Extirpation of aural fistula

Ear fistula in the horse is most often caused by a dentigerous cyst. The opening of the tract is commonly located on the cranial border of the pinna, 1-3 cm from its base [009]. The cyst is usually attached to the temporal bone, under the temporalis muscle. In most cases the cyst contains one or more aberrant teeth, which may be detected by introducing a probe into the cyst [010], but in some cases only a cyst is present. Definitive diagnosis demands radiographic examination [011]. The only treatment is surgical. *Surgery.* Surgery is carried out with the animal in lateral recumbency under general anaesthesia. The external auditory meatus is packed with a sterile gauze plug, and a probe is inserted into the fistulous tract. A skin incision is made around the opening and extended along the border of the ear, immediately over the probe. The fistulous tract is dissected completely free from the surrounding tissue [012]. Opening of the fistulous tract and damage to the aural cartilage must be avoided. When the base of the fistula

is reached the skin incision is extended over the cyst. Careful searching with the probe may give an accurate indication of the position and extent of the cyst. The temporalis muscle is bluntly dissected in the direction of its fibres; wound retractors facilitate exposure of the cyst and its contents [013]. The cyst is then bluntly dissected. If the tooth is firmly attached to the temporal bone it must be levered out using a chisel [014] and forceps [015]; in doing so care must be taken to prevent fracture of the temporal bone. Before closure, it must be established that all aberrant teeth have been removed.

The temporalis muscle and subcutaneous tissue are sutured with simple interrupted sutures of absorbable material, after a latex drain has been inserted. The skin is also sutured with simple interrupted sutures [016]. Systemic antibiotics are administered. The latex drain is removed on the second or third postoperative day and the skin sutures on the tenth postoperative day.



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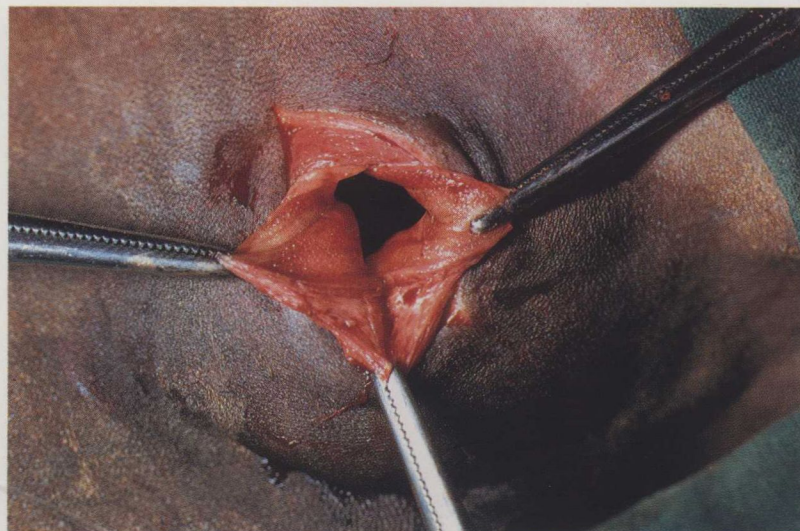


1-3 Drainage and fenestration

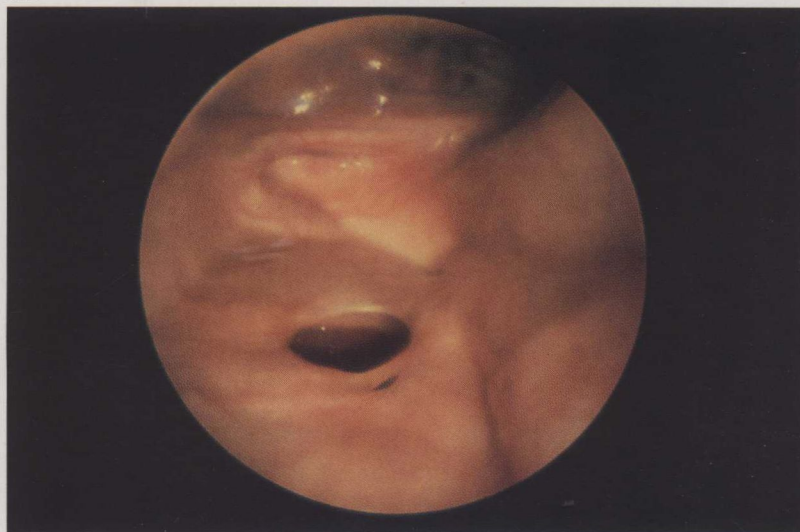
Guttural pouch drainage is indicated in chronic empyema, chondroids and tympany, the latter of which is observed only in foals [017].

Surgery. Surgery is usually performed with the animal in lateral recumbency under general anaesthesia. The guttural pouch is commonly opened through Viborg's triangle, which is bounded by the linguofacial vein, the tendon of the sternocephalic muscle, and the vertical ramus of the mandible. A 3–5 cm incision is made dorsal and parallel to the vein through the skin and subcutaneous fascia. The connective tissue at the ventral border of the parotid is bluntly dissected, until the guttural pouch submucosa has been reached. A fold is carefully elevated as far as possible, and opened with scalpel or scissors [018]. If possible the wall of the guttural pouch is sutured to the edges of the skin wound. Abnormal contents are removed by flushing with a mild disinfectant. A rubber tube is inserted into the drainage opening, and fixed to the skin with sutures [019]. Postoperative flush-

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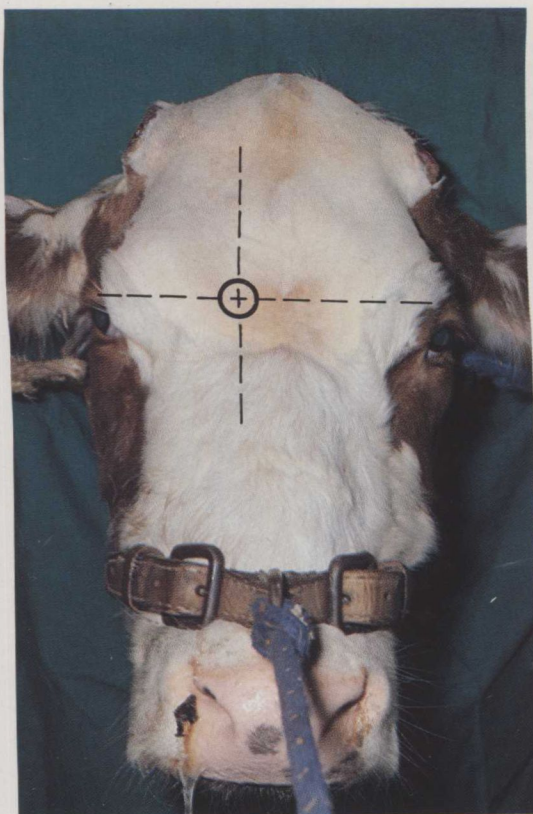
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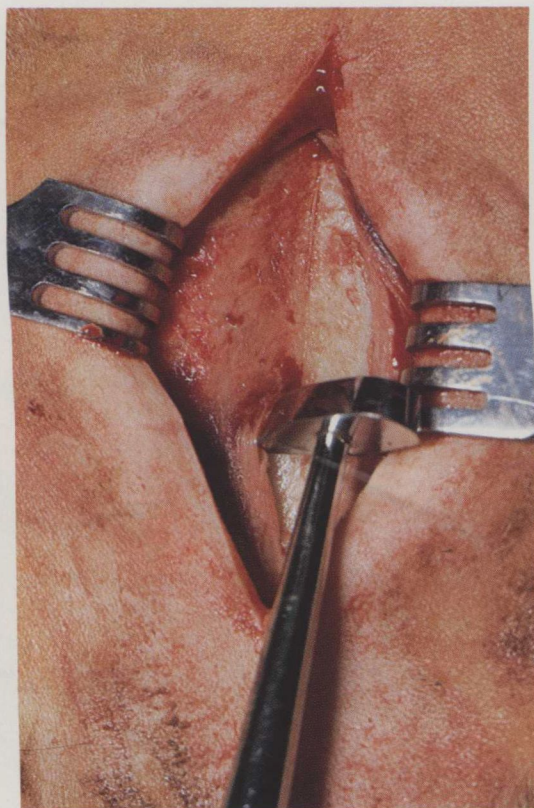
ing is carried out until exudation has ceased; during this period the tube is left in place.

In unilateral tympany the tympanic pouch is opened through Viborg's triangle, and a fenestration is made in the septum between the right and left guttural pouch, using long tissue forceps and scissors [020]. In bilateral tympany one pouch is opened, fenestration performed, and the mucous membrane flap (valve) at the outlet of the Eustachian tube of the opened pouch dissected. In both cases the opened guttural pouch is drained and flushed until exudation has ceased.

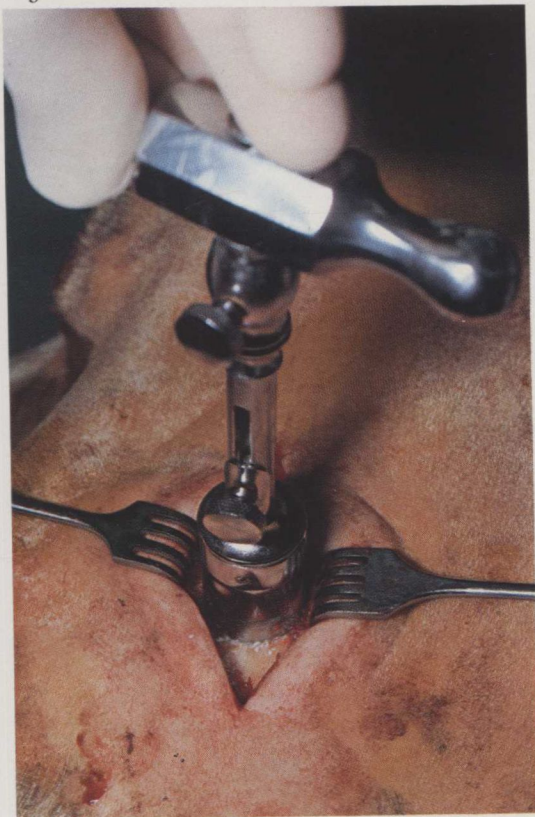
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1-4 Trephination of the frontal sinus in cattle

Trephination of the frontal sinus is indicated in chronic empyema, which in adult cattle is caused usually by infection of the sinus following de-horning or horn fracture. Initially the sinusitis is often confined to the caudal part of the sinus, but in long-standing cases the entire sinus may be involved. In the latter case drainage of the sinus is obtained by trephining 2 cm from the midline on a line passing through the centre of the orbits [021]. If the original opening to the sinus at the site of the dehorning wound is narrowed or closed by granulation tissue, it is enlarged or re-opened under cornual nerve block to facilitate adequate flushing of the sinus.

Surgery. Trephination is carried out on the standing animal under local analgesia. An approximately 5 cm long vertical incision is made through skin, subcutis and periosteum. The periosteum is dissected from the bone with a periosteal elevator [022] and drawn aside, together with the skin, with wound retractors. The point of the trephine is inserted into the bone. Trephination is performed by rotating the trephine [023]. After a circular groove has been cut into the bone, the point of the trephine is retracted, and trephination is continued through the full thickness of the bone. The disc is removed with a bone screw inserted into the hole made previously by the point of the trephine. Sometimes the disc must be levered out because it remains fixed to a bony sinus septum.

To remove exudate and necrotic tissue the sinus is flushed thoroughly with a disinfectant solution [024].

To prevent premature closure of the openings they are packed with gauze bandage plugs. Post-operative flushing is repeated daily, until the sinus has healed, as evidenced by absence of purulent discharge.

025



027



1-5 Trephination of the maxillary sinuses and repulsion of teeth in the horse

Trephination of the maxillary sinuses is indicated in cases of empyema, cysts or neoplasms, and for repulsion of upper molar teeth. Plate 025 represents a radiograph showing chronic alveolitis of the first upper molar. The rostral maxillary sinus is trephined about 2-3 cm dorsal to the rostral end of the facial crest; the caudal maxillary sinus is trephined 2-5 cm rostral to the medial canthus and 2-3 cm dorsal to the facial crest [026]. Care must be taken to avoid damage to the nasolacrimal duct.

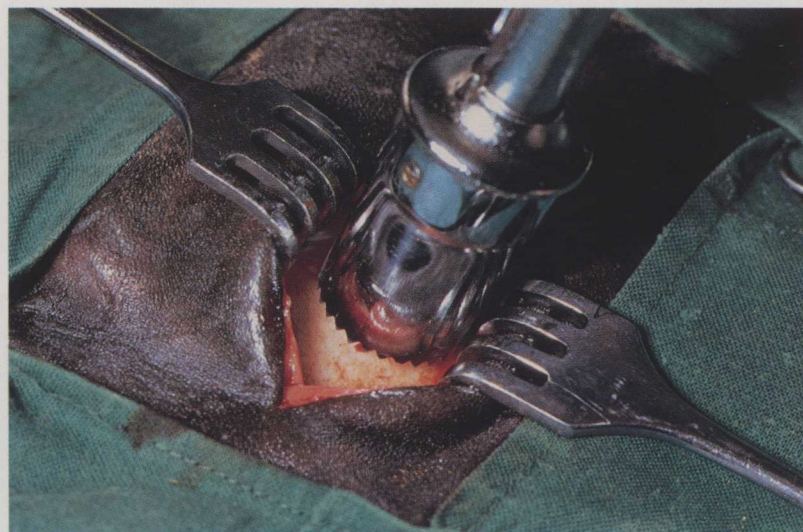
Surgery. The operation may be carried out either on the standing animal under local infiltration analgesia, or on the recumbent animal [027] under general anaesthesia. In case of tooth repulsion general anaesthesia is required.

At the selected site an approximately 4 cm long incision is made parallel to the facial crest through the skin and subcutaneous tissue. Depending on

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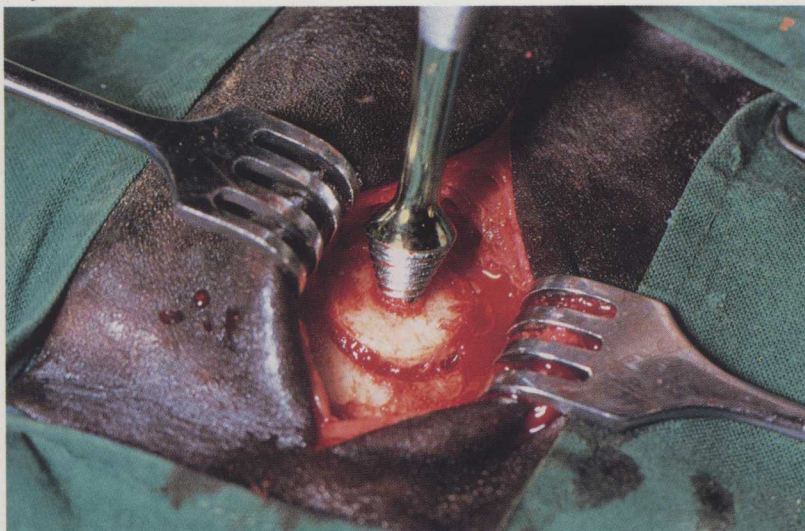


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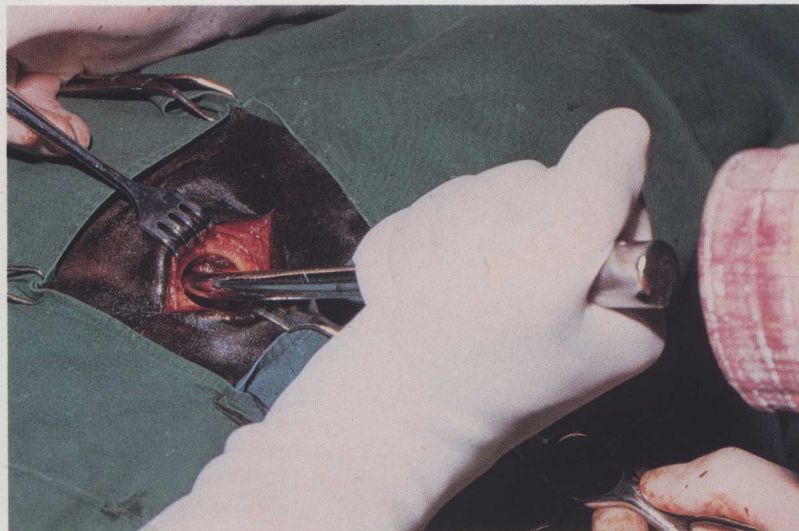


the site of surgery it may be necessary to retract the levator labii maxillaris muscle in order to expose the periosteum. The periosteum is then incised with a scalpel and separated from the bone with a periosteal elevator. The wound edges of the skin and periosteum are drawn aside with wound retractors [028]. Trephination is performed as described in 1-4. The disc is removed with a bone screw [029]. In empyema caused by alveolitis, the sinus is flushed and the affected tooth is carefully located. A punch is then introduced into the sinus and placed upon the roots of the tooth to be repelled. To prevent damage to adjacent teeth and the maxillary bone, the punch must be placed accurately; it may thus be necessary to enlarge the trephination hole with rongeurs. The tooth is repelled from its alveolus with firm, but careful, blows [030]. The course of repulsion is constantly checked by the surgeon's hand in the oral cavity. After removal the tooth is examined to determine if it is complete. Any tooth or bony fragments must be removed. Intra-operative radiography is recommended to ensure that no fragments remain. The sinus and alveolus are copiously flushed with a

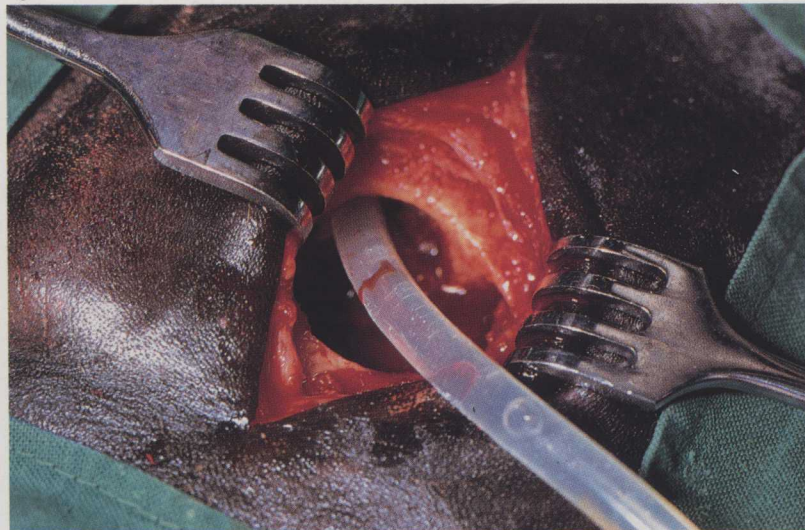
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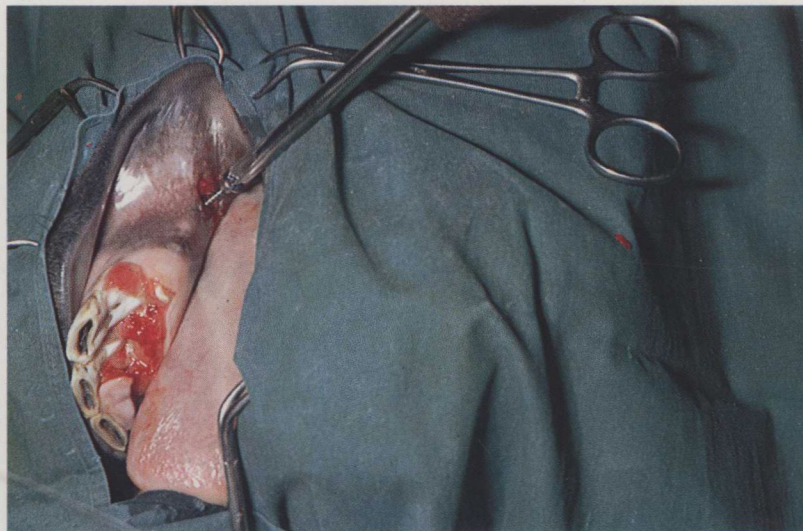


disinfectant solution [031]. The alveolus and trephination hole are then packed with povidone iodine soaked gauze bandage plugs [032]. Postoperatively the sinus and alveolus are repeatedly flushed after removal of both plugs. The plug placed in the alveolus after flushing must be somewhat smaller than the previous one, in order to enable granulation tissue to gradually fill the alveolus; the plugs in the trephination hole are of constant size. Only when the alveolus is closed off by granulation tissue and exudation in the sinus has ceased is the trephination hole allowed to close.

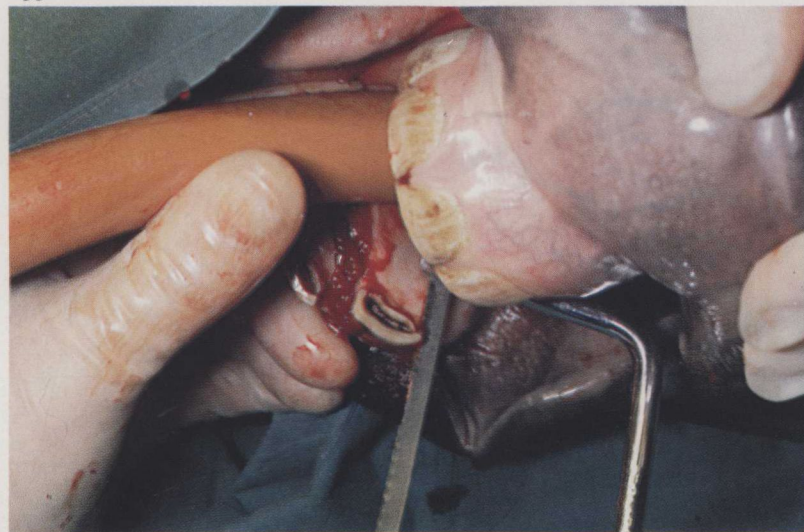
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1-6 Treatment of premaxilla and mandibular body fractures

Fractures of the maxilla and mandible have been observed in all large animals but occur most frequently in horses and cattle. Self-inflicted trauma and external violence are the most common causes. In horses, fractures involving the incisor teeth and a variable sized fragment of premaxilla or mandible occur frequently [033]. The deciduous teeth in young animals are frequently involved. Because these teeth have short roots the injury is often minor and of little consequence. Clinically, dislocation of the incisor teeth is obvious. The wound may be packed with feed if the animal has attempted to eat. Teeth may be loose, broken or missing.

Surgery. The operation should be performed in lateral recumbency under general anaesthesia. Debris and granulation tissue, if any, are removed and the wound is carefully cleansed and disinfected. The fragment should be fixed to the premaxilla or mandible by wiring the incisor teeth, but compression in a caudal direction may also be necessary. A canine tooth is used

for the caudal fixation, but if absent (as in this case) a cortical screw is placed in the interalveolar space [034]. To prevent the wire from slipping off the teeth, grooves are made with a hack saw or file in the neck of both third incisors [035] and in the canine teeth. By tightening the stainless steel cerclage wire around the unfractured teeth the fragment is stabilised laterally, and additional stabilisation and compression is achieved by applying and tightening the wire around the canine tooth or the screw [036]. Postoperatively, there is usually no problem associated with prehension or mastication. Healing of the fracture takes place in 4–8 weeks depending on the age of the patient. After healing the wire must be removed.

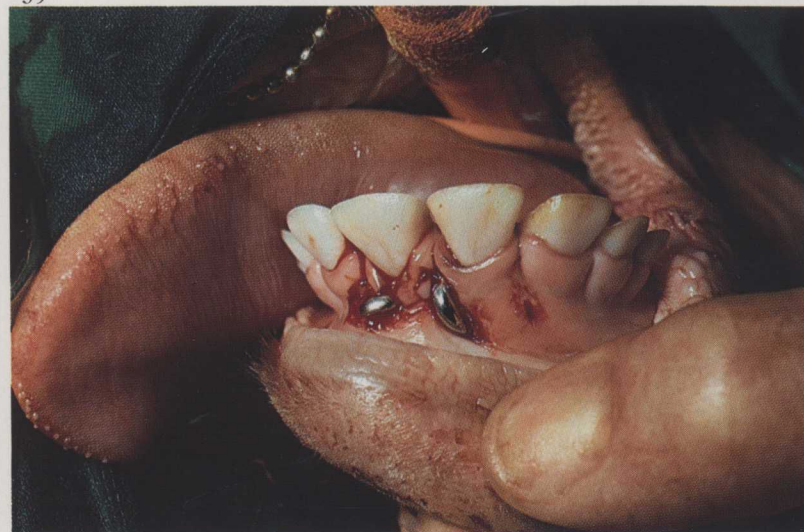
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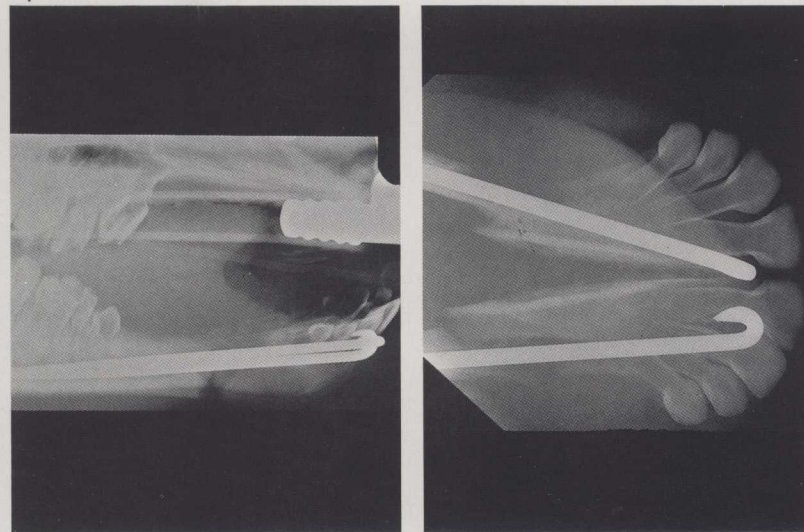
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1-7 Treatment of mandibular interdental space fracture

Fracture in the interdental space is the most common fracture involving the horizontal rami of the mandible. The fractures may be unilateral or bilateral [037] and usually compound into the mouth. Unilateral interdental space fractures without severe dislocation heal spontaneously. Bilateral fractures of the interdental spaces cause dislocation of the rostral part [038], and require osteosynthesis.

Surgery. The operation should be performed with the patient in lateral recumbency under general anaesthesia. In this case intramedullary nailing was chosen because the rostral fracture fragment was too short for plating or transfixation.

Implantation of the nails precisely in the mandibular rami without damaging the roots of the teeth demands radiographic monitoring during surgery to ensure accurate insertion of the drill. After reposition of the fracture a hole is drilled in each mandibular ramus beginning medioventral to the

two first incisor teeth or between the first and second incisor teeth. The two Rush nails, previously cut to the required length and contoured correctly, are inserted with a hammer and impactor [039]. It is important that the nails do not damage the roots of the premolars [040]. Postoperative feeding must be modified, but in sucklings nursing can be permitted. In the event of compound fracture bone sequestration often occurs, in which case purulent material usually escapes from draining tracts inside and/or outside the mouth. Sequestra must be removed, after which discharge ceases. Healing of the fracture takes place in 4-8 weeks depending on the age of the patient; implants may then be removed.