Perineal hernia repair in the dog by a modified technique of transposition of the internal obturator muscle. Long term results in 60 patients.

SUMMARY

A modified technique for transposition of the internal obturator muscle was used to repair perineal hernia in 60 dogs. Herniorrhaphy was performed with a single continuous suture. Complications and long-term results are described. The most frequent complication was urinary incontinence (15%). We suggest that perineal hernia predisposes dogs to urinary incontinence after castration. The recurrence rate of perineal hernia was 3%. The owner's assessment of the surgical result was good in 90% and moderate in 10% of the cases.

INTRODUCTION

Perineal hernia is a condition in which the pelvic diaphragm is no longer intact. The pelvic diaphragm consist of the levator ani muscle and the coccygeus muscle (1). In nearly all cases the caudal part of the levator ani muscle is completely absent (2). This may result in subsequent herniation of the rectum and pelvic organs into the ischiorectal fossa (3,4,5,6). Perineal hernia occurs mainly in middle-aged to older intact male dogs (7). Figure 1 shows the anatomical relations of the normal perineum and of perineal hernia (8).
The pathogenesis of the perineal hernia is not completely clear. Androgen receptor-binding in the muscles of the pelvic diaphragm in dogs with a perineal hernia is different than dogs without a perineal hernia (9). Relaxin-like factors/hormones of prostatic origin have been described as a local factor in connective tissue weakening and subsequently in perineal hernia formation (10). Neurogenic atrophy of the muscles of the pelvic diaphragm caused by damage of the innervating nerve branches is indicated as an important factor in the development of perineal hernia (11). Transposition of the internal obturator muscle is currently regarded as the preferred method for surgical repair of perineal hernia (7,12,13,14,15).
In this article we describe a modification of this technique. Herniorrhaphy is performed with a continuous suture pattern instead of single interrupted sutures.
The results and complications in 60 dogs are reported.

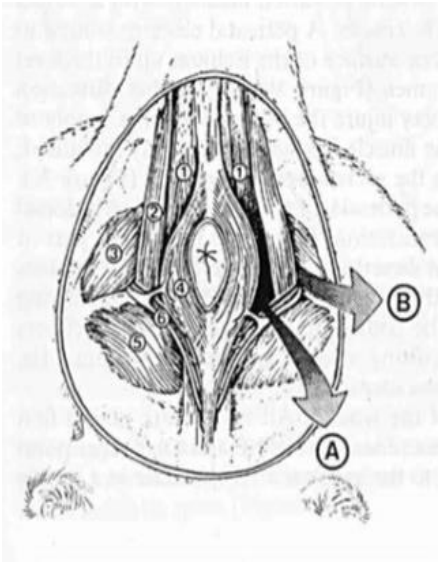

Figure 1. Anatomical relations of the normal perineum (left side) and of the perineal hernia (right side). Numbers indicate the levator ani muscle (1), coccygeal muscle (2), superficial gluteal muscle (3), external anal sphincter (4), Internal obturator muscle (5), and the pudendal artery, vein and nerve (6). The sacrotuberous ligament is hidden by the superficial gluteal muscle. In perineal hernia, atrophy of the caudal part of the levator ani muscle causes the pelvic contents to herniate through an opening between the external anal sphincter and the coccygeal muscle (A). Incidentally, a hernia may also occur between the coccygeal muscle and the superficial gluteal muscle (B).

SURGICAL TECHNIQUE

The reported technique for herniorrhaphy is a modification of the technique previously described (8). Preparation for surgery and the exposure of the pelvic muscles and other relevant structures is identical to the original description. The tendon of the internal obturator muscle is completely transsected. Figure 2 shows the mobilisation of the internal obturator muscle at the right side (8).

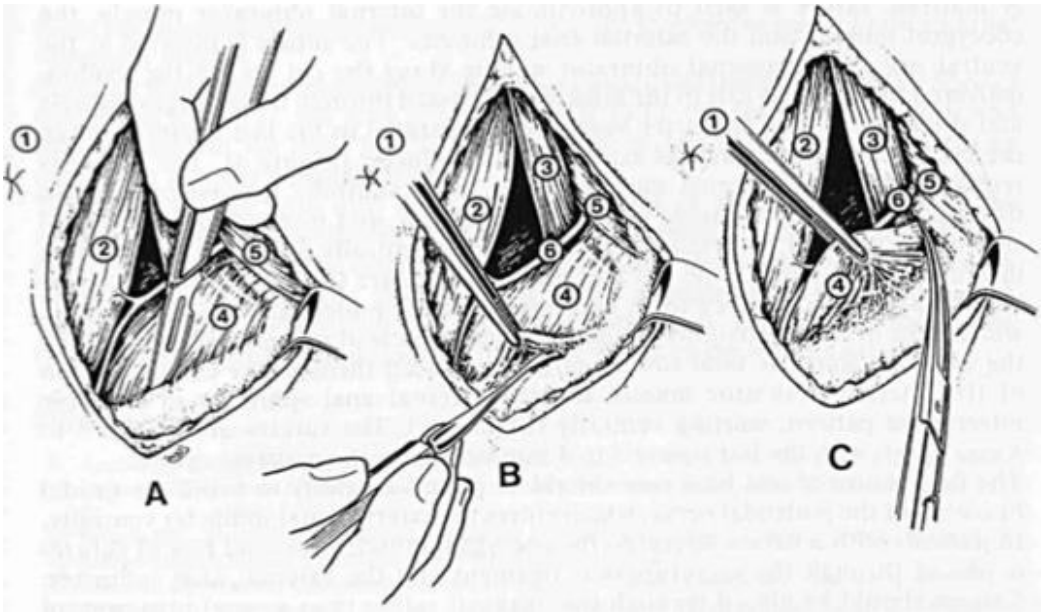

Figure 2. Mobilisation of the internal obturator muscle at the right side.
Numbers indicate the anus(1), the external anal sphincter (2), the coccygeal muscle (3), the internal obturator muscle (4), the superficial gluteal muscle (5), and the pudendal nerve (6). The sacrotuberous ligament is hidden by the superficial gluteal muscle. The aponeurosis of the internal obturator muscle is incised (A), after which a periostal elevator is used to separate the muscle from the ischiatic table (B). When the muscle is sufficiently mobilised, the tendon is completely severed directly medial to the superficial gluteal muscle (C).

Once the relevant muscles and the pudendal nerve and accompanying vessels are properly identified and exposed, closure of the hernia can be started. The suture pattern is different from the pattern previously described.
Only one double armed suture is used. Suturing starts with a U-shape suture which begins in the middle of the external anal sphincter. The suture is inserted into the anal sphincter caudally and exits the sphincter cranially, then passed through the base of the coccygeal muscle from medial to lateral. The suture is then passed through the obturator muscle from dorsal to ventral exiting through the tendon near to the cranial margin. The second armed end of the suture is placed through the anal sphincter dorsal to the first and follows a similar pattern passing through the coccygeal muscle dorsal to the first passage and more caudal through the obturator muscle (Figure 3).

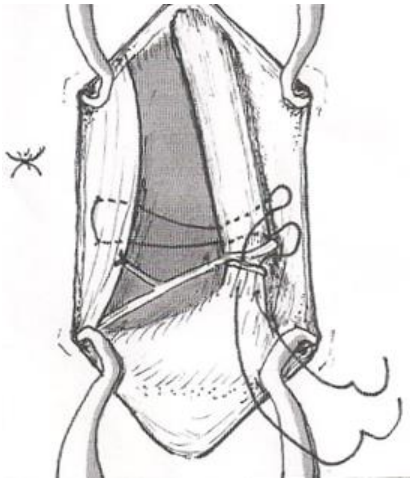

Figure 3. First U-shape suture.

The pudendal nerve enters the surgical field lateral to the base of the coccygeal muscle and transverses the fossa ischiorectalis in a medial direction towards the cranial border of the anal sphincter. The pudendal nerve is accompanied by an artery and vein. While placing this U- shaped suture care should be taken not to damage these structures.
The suture is then tied with a surgical knot apposing the 3 muscles and closing the central part of the hernia. Before this suture is tied all tension created by retractors, used for exposition of the surgical field, should be released.
Suturing is now continued with one of the 2 armed ends of the tied suture. The suture pattern is from lateral to medial through the base of the coccygeal muscle and from cranial to caudal through the anal sphincter. This pattern is repeated in a continuous fashion towards the dorsal border of these muscles (Figure 4). At this point this suture is tied closing the dorsal part of the hernia.

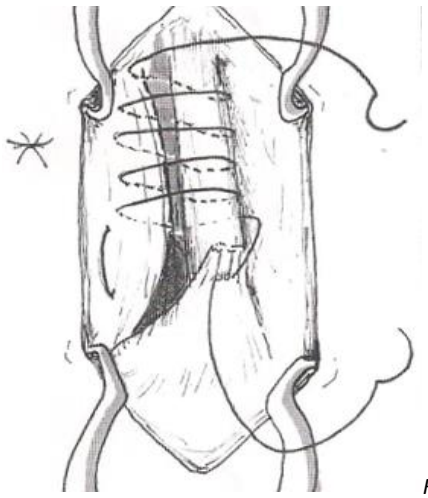

Figure 4. Continuous sutures through the coccygeal muscle and the anal sphincter.

The ventral part of the hernia is closed with the other armed end of the suture. A similar continuous pattern is used starting ventral in the obturator muscle, exiting dorsal or in the aponeuris and from cranial to caudal through the anal sphincter (Figure 5). While placing these suture loops care should be taken not to damage the pudendal nerve or its insertion in the cranial border of the anal sphincter. Once the hernia is closed at the ventromedial end the suture can be tied. Both remaining

ends of the suture are cut and discarded. The perineal hernia is now closed and the subcutis and skin can be closed routinely.
All surgical procedures were performed by the first author.

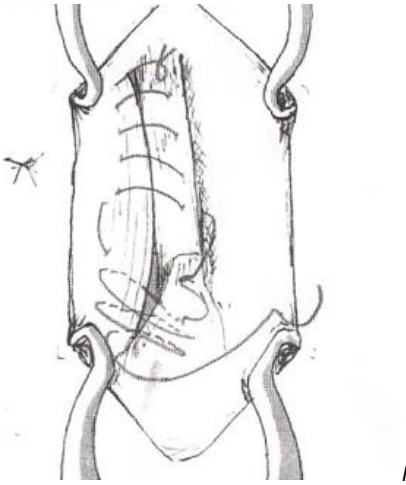

Figure 5. Continuous suture through the obturator muscle and the anal sphincter.

MATERIAL AND METHODS

Patients
Dogs diagnosed with perineal hernia between July 2009 and March 2013 were the subject of this study. Diagnosis was made by rectal examination. Elective additional diagnostic techniques were abdominal palpation and ultrasonography to determine abnormalities of the prostate gland and the urinary bladder. Dogs were selected from the records employing the search term "perineal hernia" in the letters sent to the referring veterinarians. Sixty dogs were available for follow up. Follow up periods ranged minimal 6 months to 50 months (median 27 months). The average age of the 60 patients was 8 years 11 month, ranging from 2 years 9 months to 14 years 1 month.

Clinical signs and diagnoses
All patients were referred for surgery. Table 1 presented the clinical signs and diagnoses before surgery.

Clinical signs	*No. of patients, (percentage)*
Straining	54 (90%)
Perineal swelling	40 (67%)
Pain expressions during defecation	23 (38%)
Diarrhea	4 (7%)
Urinary incontinence	3 (5%)
Stranguria	2 (3%)
Rectal prolapse	2 (3%)
Anal sacculitis	2 (3%)
Fistula	1 (2%)
Subcutaneous haemorrhage	1 (2%)

Table 1. Clinical signs and diagnoses at initial presentation.

Presurgical diagnosis of herniation and additional diagnosis (at first presentation) are presented in table 2.

Operated side		*No. of patients (total 60)*
Bilateral hernia		29 (48%)
Unilateral hernia	Right side	16 (27%)
	Left side	15 (25%)
Urinary bladder dislocation		1 (2%)
Prostate gland in ischiorectal fossa		2(3%)

Table 2. Presurgical diagnosis.

Two dogs had unilateral hernia at initial presentation and were presented with an ipsilateral hernia at 8 and 30 months after initial surgery. One dog had initial perineal herniorrhaphy elsewhere and was presented to us 12 months later for an ipsilateral hernia. All three dogs were classified as bilateral hernia.
In the two dogs with stranguria the prostate gland was luxated to the ischiorectal fossa. In one of these dogs the bladder was also luxated to the ischiorectal fossa (cranial to the prostate gland). One of the dogs with urine incontinence prior to surgery had a caudally luxated prostate gland, but the prostate gland was cranial to the ischiorectal fossa.

Castration status
Six of the dogs were castrated prior to referral. Five of these dogs were surgically castrated and one dogs was chemically castrated.

Surgical methods
All 60 patients were surgically treated with the modified technique of transposition of the internal obturator muscle, as described above. Antimicrobial prophylaxis was used in all dogs and consisted of gentamycine[3] 5 mg/kg and lincomycine[4] 10 mg/kg. The perineal hernia was closed with a non-absorbable monofilament polypropylene[5] suture armed with two needles.

Of the 54 intact dogs 53 were castrated during the surgical procedure. Castration was either surgical (18) or chemical (35). Chemical castration was with delmadinone[1] in 18 dogs and with desloreline[2] in 17 dogs. One intact dog was not castrated at surgery on the owner's request, because of mild urinary incontinence.

Additional post-operative medical treatment consisted of: metronidazole[6] 15-20 mg/kg t.d.d. for 7 days, and carprofen[7] 4 mg/kg d.d. for 7 days in all dogs. In 2012 Tramadol®[8] 2-4 mg/kg, t.d.d. for 5 days was added to the post-surgical medication. An Elizabethan collar was provided in all dogs.
All but one dog were discharged on the day of surgery.

RESULTS

Follow up
Follow up was made by a telephone enquiry in which a set of standardised questions were presented to the owners. They were asked which problems the dog exhibited before and after surgery, about early and late complications after surgery, castration status, eventual medication and recurrence. They were also requested to describe the result of the operation as good (normal

defecation, no complications), moderate (improved but abnormal defecation, or minor complications, or both), or poor (no improvement of defecation, or major complications, or both).

Complications
Data on early and late complications after surgery were also obtained retrospectively during this enquiry and or from the medical records.

Early complications
One dog required prolonged hospitalization for two days due to excessive expression of pain. Treatment consisted of extra analgesics.
One dog had acute kidney failure 2 days after surgery. The dog was re-hospitalized and successfully treated.
Wound-dehiscence at suture removal occurred in one dog. Spontaneous healing occurred within a few days during which the wound was gently flushed by the owners with a solution of povidone-jodine[9]. The insertion sites of the skin sutures were mildly inflamed in one dog. Local treatment with honey ointment[10] was initiated (16).
Metranidazole[6]-associated neurological signs developed in another one dog. Spontaneous resolution occurred after the metronidazole[6] discontinuation (17). One dog developed a persistent but mild stiff gait on the ipsilateral side after surgery. Because of the mild (low grade) symptoms no further investigation was requested by the owner.
Wound infection did not occur in any of the dogs.

Late complications
One dog had a rectum prolapse 3 months after surgery. In this dog anal sphincter paresis was noted at initial presentation prior to herniorrhaphy. Treatment consisted of colopexy.
In one dog perineal swelling ventral to the anus was noted 18 months after surgery. At re-examination 28 months after surgery there was no evidence of recurrence of hernia. However loss of tissue rigidity was palpated ventral to the anus. The dog had no problems with defecation. One dog developed faecal incontinence 3 months after the surgery and urinary incontinence at 4 months after surgery. At re-examination at 9 months after surgery there was no recurrence of herniation. The occurring incontinences could not be explained. The owners declined further investigation.

Recurrences
Recurrence of herniation was defined as the disruption of the reconstructed pelvic diaphragm. Recurrence occurred in 2 dogs (3%).
In one dog recurrence occurred at 4 months on the right side after bilateral herniorrhaphy. Additional surgery was performed: a prolene[11] mesh was used to close the hernia. At 16 months a recurrence occurred on the left side and this could be closed by repeating the surgical procedure described. At 30 months after the third procedure the dog was re-examined because of persistent straining at defecation. There was no evidence for recurrence on either side. The straining could not be explained.
Recurrence occurred in another dog after bilateral herniorrhaphy at 10 months on the right side. An additional procedure was performed. A prolene[11] mesh was used to close the hernia. At 33 months after initial surgery this dog was re-examined because of minor perineal swelling of the left side. A small area of recurrence was palpated centrally in an otherwise rigid reconstructed pelvic diaphragm. A small amount of pelvic fat protruded through this area of recurrence and was the cause of the perineal swelling. There were no problems with defecation in this dog.

Urinary incontinence
Urinary incontinence occurred in 9 dogs.

Three of these dogs had urinary incontinence prior to surgery. In one dog this was a lifelong condition that did not change after surgery. At the surgery a surgical castration was performed. The urine loss was acceptable to the owners and was left untreated.
The other two dogs had urinary incontinence before the surgery for a few months which increased after surgery. One of them was chemical castrated at time of surgery and the other dog was not castrated (chemical or surgical). Treatment was successful and consisted of fenylpropanolamine-HCL[12].
Six dogs developed urinary incontinence as a long term complication (2, 4, 6, 12, 18 and 36 months) after surgery. The dogs with incontinence 2 and 18 months after surgery were chemical castrated at time of surgery. The owners of both dogs find treatment unnecessary. The dogs with problems started 4 months after surgery was chemically castrated at time of surgery. Treatment was successful and consisted of fenylpropanolamine-HCL[12]. The dog with incontinence 6 months after surgery was already castrated surgical by their own veterinarian 4 weeks before hernia perineal surgery. The owners find treatment unnecessary. The dog with incontinence started 12 months after surgery was chemically castrated after the surgery. The incontinence disappeared after the chemical castration was discontinued one year later. The dog with incontinence after 36 months was chemically castrated at time of surgery. Three years later the dog was surgical castrated and developed urinary incontinence. Treatment was successful and consisted of fenylpropanolamine - HCL[12].

Early and late complications, recurrences and the occurrence of urinary incontinence are summarised in table 3.

Early complications	***No. of patients***
Kidney failure	1
Excessive expression of pain	1
Wound-dehiscence at suture removal	1
Metranidazole[4]-associated neurological signs	1
Mild stiff gait on the ipsilateral side after surgery	1
Inflamed insertion sites on the skin sutures	1
Late complications and recurrences	
Rectum prolapse (3 months after surgery)	1
perineal swelling (fat from ischiorectal fossa)	1
Perineal swelling ventral of the anus	1
Perineal swelling	2
Faecal incontinence	1
Straining	2
Recurrences	2
Urinary incontinence (UI)	
Lifelong UI	1
One year before surgery UI started	1
Two months before surgery UI started	1
2,4,6,12,18,36 months after surgery UI started	6

Table 3. Early and late complications, recurrences and urinary incontinence.

Owner's assessment
Fifty-four (90%) of the owners were satisfied with the outcome of surgery and rated the result of treatment as good. Six (10%) owners rated the results as moderate.
Results were rated as moderate for different reasons: perineal swelling (3 dog), straining (2 dogs), faecal incontinence (1 dog), and recurrence of herniation (2 dogs). These problems occurred singly or in combination.

DISCUSSION

The recurrence rate of 3% reported in this study is comparable to the recurrence rates reported in other studies in which the internal obturator transposition technique was used for herniorrhaphy, 4,6% (13), 5% (18). Higher recurrence rate up to 33% (15) have also been reported. It may be concluded that using a continuous suture pattern does not result in a increase of recurrence rates. This study was retrospective and not designed to compare the time needed for herniorrhaphy using (preplaced) interrupted sutures versus the time needed for the described continuous suture pattern. Other studies comparing continuous suture patterns with interrupted suture lines/patterns demonstrate the time benefit of a continuous pattern (19, 20, 21, 22). The time savings various between 9% (21), 16% (20), 17% (19) up to 50% (22). These greater reductions in closure time may have been due to the larger incisions in some studies (19).
It is our opinion that the continuous suture technique is a straight forward procedure which is much faster for herniorrhaphy than the use of preplaced interrupted sutures.

Urinary incontinence was the most frequent complication (15%) and occurred prior to herniorrhaphy (5%) and after herniorrhaphy (10%). Most of the dogs (6 of 9) in which urinary incontinence occurred were castrated (surgical or chemical) prior to the occurrence of urinary incontinence. Other studies reported 4% (23), 5% (18), 6,5% (15) up to 36% (24).
Urinary incontinence after (surgical) castration in dogs with no evidence for perineal hernia does not occur very often. Most reports describe its occurrence as infrequent (30,31). It has been reported in 0,8% (25) of the dogs after castration.
From electromyography of the pelvic diaphragm and anal sphincter it was concluded that damage to the innervating nerves was an important factor in the development of perineal hernia. These innervating nerves originate from the sacral plexus. The nerve supply of the urinary bladder sphincter also (partly) originate from the sacral plexus (26). It can be speculated that the relative high incidence of urinary incontinence in dogs with perineal hernia is explained by the damage to the innervating nerves. It seems unlikely that comparable nerve damage is also present in dogs without perineal hernia.

Local inflammation of the suture sites and dehiscence of the wound may be signs of low grade infection. We considered wounds to be infected if purulent material drained from it or could be aspirated from it (or the ischiorectal fossa) (27). We have found no evidence for wound infection in this study. The incidence of wound infections and perineal fistulas is much lower than reported in others, wound infection 45% and perineal fistula 7% (18), wound infection 28,6% (28), 22% (29), 17% (24) and 11% (23).
The low incidence of wound infection is may be attributed to the standard use of antimicrobial prophylaxis (and post-operative therapy). Various studies have demonstrated that the surgical experience of the surgeon performing the procedure is an important factor in the surgical result (7,15,25). It is our opinion that a fast and straight forward procedure for herniorrhaphy attributes to an optimal surgical result.

REFERENCES

1. Evans H.E., Christensen G.C. (1979). Miller's Anatomy of the dog. (336-337), Saunders Company.
2. Tobias K.M., Johnston S.A. (2012). Veterinary Surgery Small Animal, volume 2. (1589-1590). Elsevier inc.
3. Burrows CF, Harvey CE. Perineal hernia in the dog. J Small Anim Pract 1973; 14: 315-32
4. Hayes HM, Wilson GP, Tarone RE. The epidemiologic features of perineal he rnia in 771 dogs. J Am Anim Hosp Assoc 1978; 14: 703-7.
5. Orsher RJ, Johnston DE. The surgical treatment of perineal hernia in dogs by transposition of the obturator muscle. Comp Cont Ed 7, 1985; 233-9.
6. Weaver AD, Omamegbe JO. Surgical treatment of perineal hernia in the dog. J Small Anim Pract 1981; 22: 749-58.
7. Fossum T.W. (2007). Small animal surgery. (519-525), Mosby.
8. F.J. Sluijs, B.E. Sjollema. Perineal hernia repair in the dog by transposition of the internal obturator muscle. 1. Surgical technique. Vet Q. 1989 Jan;11(1):12-7.
9. F.A. Mann et all. Androgen receptors in the pelvic diaphragm muscles of dogs w ith and without perineal hernia. Am J Vet Res. 1995 Jan;56(1):134-9
10. G.W. Niebauer et all. Relaxin of prostatic origin might be linked to perineal hernia formation in dogs. Ann N Y Acad Sci. 2005 May;1041:415-22.
11. B.E. Sjollema et all. Electromyography of the pelvic diaphragm and anal sphincter in dogs with perineal hernia. Am J Vet Res. 1993 Jan;54(1):185-90.
12. Monnet E. (2013). Small Animal Soft Tissue Surgery 32.
13. Hardie E, Kolatra R, Early T, et al. Evaluation of internal obturator muscle transposition in treatment of perineal hernia in dogs. Vet Surg 1983; 12:69–72.
14. Bellenger CR, Canfield RB. Perineal hernia. In: Slatter D, ed. Textbook of small animal surgery. 3rd ed. Philadelphia: WB Saunders Co, 2003; 487–498.
15. Orsher R. Clinical and surgical parameters in dogs with perineal hernia. Analysis of res ults of internal obturator muscle transposition. Vet Surg 1986; 15:253–258.
16. J. Kirpensteijn, G. Ter Haar (2013) Reconstructive surgery and wound management of the dog and cat. (33-34), Manson.
17. Dow SW et al.: Central nervous system toxicosis associated with metronidazole treatment of dogs: five cases (1984-1987). J Am Vet Med Assoc 195:365–368, 1989.
18. F.J. van Sluijs, B.E. Sjollema. Perineal hernia repair in the dog by transposition of the internal obturator muscle. 2. Complications and results in 100 patients. Vet Q. 1989 Jan;11(1):18-23.
19. Kummeling A, van Sluijs FJ. Closure of the rectus sheath with a continuous looped suture and the skin with staples in dogs: speed, safety, and costs compared to closure of the rectus sheath with interrupted sutures and the skin with a continuous subdermal suture. Vet Q. 1998 Oct;20(4):126-30.
20. Kokanalı D, Ugur M, Kuntay Kokanalı M, Karayalcın R, Tonguc E. Continuous versus interrupted episiotomy repair with monofilament or multifilament absorbed suture materials: a randomised controlled trial. Arch Gynecol Obstet. 2011 Aug;284(2):275-80.
21. Valenzuela P, Saiz Puente MS, Valero JL, Azorín R, Ortega R, Guijarro R. Continuous versus interrupted sutures for repair of episiotomy or second-degree perineal tears: a randomised controlled trial. BJOG. 2009 Feb;116(3):436-41.
22. Richards PC, Balch CM, Aldrete JS. Abdominal wound closure. A randomized prospective study of 571 patients comparing continuous vs. interrupted suture techniques. Ann Surg. 1983 Feb;197(2):238-43
23. Hosgood G, Hedlund CS, Pechman RD, Dean PW.: Perineal herniorrhaphy: perioperative data from 100 dogs. J Am Anim Hosp Assoc. 1995 Jul-Aug;31(4):331-42.
24. Brissot HN, Dupré GP, Bouvy BM. Use of laparotomy in a staged approach for resolution of bilateral or complicated perineal hernia in 41 dogs. Vet Surg. 2004 Jul-Aug;33(4):412-21.
25. Maarschalkerweerd RJ, Endenburg N, Kirpensteijn J, Knol BW. Influence of orchiectomy on canine behaviour. Vet Rec. 1997 Jun 14;140(24):617-9.

26. Evans H.E., Christensen G.C. (1979). Miller's Anatomy of the dog. (554), Saunders Company.
27. Simmons BP. Guideline to prevention of surgical infections. In: Antibiotic Prophylaxis in Surgery, Conte JE, Jacob IS, Polk HC, JB Lippincott Company, Philadelphia, 1984; 157-76.
28. C.R. Bellenger. Perineal hernia in dog. Australian Veterinary Journal Volume 56, Issue 9, pages 434–438, September 1980.
29. Sjollema BE, van Sluijs FJ. Perineal hernia in the dog: developments in its treatment and retrospective study in 197 patients. Tijdschr Diergeneeskd. 1991 Feb 1;116(3):142-7.
30. Nelson RW, Guillermo Couto C. (2003). Small animal internal medicine. (576), Mosby
31. Coit VA, Gibson IF, Evans NP, Dowell FJ. Neutering affects urinary bladder function by different mechanisms in male and female dogs. European Journal of Pharmacology. Volume 584, Issue 1, 14 April 2008, Pages 153‐158.

FOOTNOTES

[1] Tardak®, Zoetis B.V., Capelle aan de Ijssel, The Netherlands.
[2] Suprelorin®, Virbac Animal Health, Barneveld, The Netherlands
[3] Gentamycine 5%, Eurovet Animal Health B.V., Bladel, The Netherlands
[4] Lincomycine 10%, Alfasan Diergeneesmiddelen B.V., Woerden, The Netherlands
[5] Prolene®, Johnson & Johnson Medical B.V., Amersfoort, The Netherlands
[6] Metrazol®, Aesculaap, Boxtel, The Netherlands
[7] Rimadyl®, Zoetis B.V., Capelle aan de Ijssel, The Netherlands
[8] Tramadol® 50 mg, Actavis B.V., Baarn, The Netherlands. / Tramadol® 20/10/5 mg, Schinkel Apotheek
[9] Betadine® Meda Pharma B.V., Amstelveen, The Netherlands
[10] Dermiel®, AST Farma B.V., Oudewater, The Netherlands
[11] Prolene®mesh, Johnson & Johnson Medical B.V., Amersfoort, The Netherlands
[12] Propalin®, Vetoquinol, s' Hertogenbosch, The Netherlands