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Evaluation of short- and long-term outcome of 85 perineal hernia repair surgeries, assessing the overall recurrence rate in unilateral and bilateral disease, and presenting the long-term outcome of the use of Fascia Lata Graft as a rescue technique

Diploma Thesis
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1. Introduction

1.1 Literature research

1.1.1. Perineal Hernia

Perineal Hernia (PH) is a common disease in sexually intact male dogs over 5 years of age, with a mean age of occurrence at 10 years, and from then on, the risk increases until 14 years of age (Hosgood et al. 1995). A few cases have also been reported in female dogs, where PH is often related to trauma (Hosgood et al. 1995, Radlinsky 2013, Sukhjit and Barstad 2018). The incidence of PH in male dogs is approximately 0.1 % to 0.4 % (Burrows and Harvey 1973, Bellenger 1980), 83 % of those being sexually intact (Hosgood et al. 1995).

Perineal hernia occurs when due to the weakening of the pelvic diaphragm musculature the perineal muscles separate. This results in a persistent rectal distention which allows caudal or lateral displacement of pelvic and/or abdominal organs that may include: a deviated and sacculated rectum, cystic paraprostatic tissue, the prostate gland, retroperitoneal fat, the urinary bladder and/or parts of the small intestine into the perineum (Radlinsky 2013, Baines and Aronson 2018, Sukhjit and Barstad 2018).

Perineal deformation can affect either one or both sides of the perineum. Four different directions of perineal hernia can be distinguished. The most common one is the caudal perineal hernia, which is a deviation between the levator ani, internal obturator, and external anal sphincter muscles (eASM). Herniation may also occur with a dorsolateral, lateral, or ventral deviation but it is less commonly described. The dorsolateral deviation occurs between the levator ani and coccygeus muscle, the lateral or also sciatic hernia is a deviation between the sacrotuberous ligament and coccygeus muscle, and the ventral hernia is a deviation between the ischiourethralis, bulbocavernosus, and ischiocavernosus muscle (Weaver and Omamegbe 1981, Hosgood et al. 1995, Radlinsky 2013, Baines and Aronson 2018).

The cause of pelvic diaphragm musculature weakening is poorly understood but is believed to be multifactorial. These factors include testicular hormones, hormonal imbalances, prostatic enlargement, relaxin leakage by the prostate, mineralized paraprostatic cysts, straining to defecate, and congenital or acquired muscle weakness or atrophy (Head and Francis 2002,

Merchav et al. 2005, Niebauer et al. 2005, Radlinsky 2013, Baines and Aronson 2018, Sukhjit and Barstad 2018).

The severity of the PH can rapidly increase if concurrent diseases such as rectal diseases, bladder retroflexion, and/or prostatic diseases are present (White and Herrtage 1986, Dupré et al. 1993, Dupré et al. 1996, Maute et al. 2001, Sukhjit and Barstad 2018).

Many techniques can be used for perineal hernia repair (PHR). Including but not limited to these are: simple traditional herniorrhaphy (Hosgood et al. 1995, Baines and Aronson 2018), internal obturator muscle transposition (IOMT) (Hosgood et al. 1995, Vnuk et al. 2008, Shaughnessy and Monnet 2015, Baines and Aronson 2018, Sukhjit and Barstad 2018), superficial gluteal muscle transposition (SGMT) (Spreull and Frankland 1980, Sukhjit and Barstad 2018) and semitendinosus muscle transposition (SMT) (Baines and Aronson 2018, Sukhjit and Barstad 2018). Augmentation techniques such as fascia lata graft (FLG) (Bongartz et al. 2005, Semiglia et al. 2011, Guérios et al. 2017, Sukhjit and Barstad 2018) and application of canine or porcine small intestinal submucosa (SIS) (Baines and Aronson 2018, Sukhjit and Barstad 2018) use biomaterial implants to get a stronger pelvic diaphragm. Additionally, prosthetic implants may be used for PHR (Baines and Aronson 2018, Sukhjit and Barstad 2018).

In 1993 a two-step protocol was developed. This study claims that, by giving the rectum back its diameter and anatomic route, using colo-, cysto-, and or vas deferspexy, the expulsive efforts while defecating can be avoided, and therefore, it favors the healing process of the following herniorrhaphy procedure and reduces the probability of recurrence (Dupré et al. 1993). Sole treatment with organopexies accompanied by a castration, has been reported with pleasing results (Maute et al. 2001).

Recurrence rate of PH has previously been investigated and evaluated in various retrospective studies (Hosgood et al. 1995, Vnuk et al. 2008, Grand et al. 2013, Shaughnessy und Monnet 2015, Guérios et al. 2017) and one prospective study (Bongartz et al. 2005), and ranges from 0 % to 27.4 % (Table 1).

Table 1 Recurrence rate reported in other studies

Authors, year	Surgery technique	Recurrence rate	Number of patients	Follow-up time	Study design
Hosgood et al. 1995	TH IOMT TH + IOMT unknown	11.8 % 0 % 0 % 0 %	51 38 3 8	7 months (Range 0–59)	retrospective
Bongartz et al. 2005	FLG	0 %	12	5 months (Range 1–12)	prospective
Vnuk et al. 2008	TH IOMT	27 % 11 %	22 18	At least 6 months	retrospective
Grand et al. 2013	IOMT	9.8 %	41	53 months (Range 6–88)	retrospective
Shaughnessy and Monnet 2015	IOMT	27.4 %	34	11 months (Range 0–46)	retrospective
Guérios et al. 2017	Modified FLG	0 %	6	24 months (Range 18–34)	prospective

TH: Traditional Herniorrhaphy, IOMT: Internal Obturator Muscle Transposition,
FLG: Fascia Lata Graft

1.1.2. Surgical Anatomy of the Pelvic Diaphragm

The lateral vertical closure of the pelvic cavity, which the rectum traverses, is defined as the pelvic diaphragm. The muscular part of the pelvic diaphragm is composed of the paired levator ani and the paired coccygeal muscle. The function of these muscles is to hold the rectum in place. The levator ani muscle is a thin muscle with a characteristic fan shape. Its origin is on the floor of the pelvis and the medial edge of the shaft of the ilium. From there, it fans out around the rectum and spreads in a caudo-dorsal direction towards the root of the tail where it inserts ventrally on the seventh caudal vertebra. The caudal part of the levator ani muscle blends with the eASM.

The paired coccygeal muscle is thicker and much better differentiated than the levator ani muscle. It is located dorsolateral to the cranial part of the levator ani. The muscle originates from the sciatic spine and runs in a caudo-dorsal direction until it inserts ventrally on the second to fifth caudal vertebrae.
The coccygeal muscle lies lateral to the superficial gluteal muscle and the sacrotuberous ligament. The sacrotuberous ligament is a fibrous chord extending from the transverse processes of the last sacral and first caudal vertebrae to the lateral angle of the ischial tuberosity. Next to the ligament runs the sciatic nerve. The gluteal muscle buries a major part of the ligament.
Covering the dorsal side of the ischium like a fan, lies the internal obturator muscle. On its dorsal surface, through the pelvic canal and laterally of the coccygeus and levator ani muscle runs the pudendal artery, vein, and nerve, with the nerve being dorsal to the vessels and dividing into the caudal rectal and perineal nerves. A branch of the pudendal nerve is the caudal rectal nerve, which is the single innervation of the eASM.
Traversing the ventral part of the levator ani muscle in a caudolateral direction runs the obturator nerve (Radlinsky 2013, Baines and Aronson 2018, Sukhjit and Barstad 2018, Hermanson et al. 2019)

1.1.3. Clinical Signs of perineal hernia

Clinical signs for PH can be divided in gastrointestinal and urogenital symptoms and local visible anatomic alterations. Most of them are gastrointestinal and include tenesmus, pain on defecation, constipation, fecal incontinence, irregular bowel movements and flatulence. Urogenital clinical signs are dysuria and/or stranguria. Local visible anatomic alterations may include unilateral or bilateral perineal swelling, perianal fecal soiling, and/or altered tail carriage (Radlinsky 2013, Baines and Aronson 2018, Sukhjit and Barstad 2018).
Both, the gastrointestinal and external perineal changes occur due to the accumulation of feces in the dilated or deviated rectum, which leads to an obstruction of the pelvic canal. Furthermore, the deviated and sacculated rectum, cystic paraprostatic tissue, the prostate gland, retroperitoneal fat, the urinary bladder, and/or parts of the small intestine may slip into the resulting hernia. This may

cause an obstruction, strangulation and/or incarceration of the herniated organs (Head and Francis 2002, Radlinsky 2013, Baines and Aronson 2018, Sukhjit and Barstad 2018).

1.1.4. Diagnosis of perineal hernia

Clinical findings and rectal examination are essential for a correct diagnosis of PH.
The rectal examination reveals the condition of the muscles of the pelvic diaphragm, deviation or sacculation of the rectum, its severity, and the presence of predisposing causes like prostatomegaly or perineal/intrapelvic masses (Radlinsky 2013, Baines and Aronson 2018, Sukhjit and Barstad 2018).
Commonly, even though on visual inspection the herniation appears to be unilateral, the rectal palpation may reveal muscular weakness on both sides. This is one suspected reason why 10% of patients with unilateral PHR develop clinical signs on the contralateral side in a period less than three years following surgery (Baines and Aronson 2018).
In addition, the perineal swelling should be palpated. It often reveals a soft fluctuant mass that can be repositioned. If the swelling is firm and painful, it suggests that incarceration or strangulation of the herniated tissue may have already occurred (Radlinsky 2013, Baines and Aronson 2018, Sukhjit and Barstad 2018).
Abdominal radiographs and ultrasonography of the abdomen and the hernia sac can be helpful to determine the severity of the PH, as it reveals the size of the prostate gland, the presence of small intestines in the hernial sac and a possible bladder retroflexion. To confirm the retroflexion of the bladder with radiography, often a urethrogram or cystogram is required. It may as well be confirmed using ultrasonography. Furthermore, by administration of oral or rectal barium, a deviation of the colon and/or rectum can be displayed using radiography (Radlinsky 2013, Baines and Aronson 2018).

1.1.5. Complications of perineal hernia

1.1.5.1. Bladder Retroflexion

The prevalence of urinary bladder retroflexion has been reported to be approximately 20 % (White and Herrtage 1986) to 24 % (Grand et al. 2013) within dogs, presented with

PH. Despite that, only 42 % of those dogs may show urinary clinical signs (White and Herrtage 1986). Laboratory findings that may indicate a bladder retroflexion are azotemia, hyperkalemia, hyperphosphatemia, and neutrophilic leukocytosis (Radlinsky 2013). If a retroflexion of the bladder has occurred, first, the bladder should be drained by catheterization. If this is not possible percutaneous or direct cystocentesis may be necessary (White and Herrtage 1986). The short- and long-term complications of patients suffering from PH with urinary bladder retroflexion were not significantly higher than in patients without bladder retroflexion (Grand et al. 2013).

1.1.5.2. Incarceration of herniated organs

Other organs that can be found in a PH are the prostate and/or small intestines. Clinical signs for visceral entrapment may be that the animal is systemically ill and/or displays signs of shock. Visceral strangulation can result in life-threatening situations (Radlinsky 2013).

1.1.6. Conservative Treatment

The objective of the treatment is to relieve and prevent the gastrointestinal and urogenital clinical signs and avoid organ entrapment and strangulation. As a part of the treatment the causative factors for the PH like hormonal imbalance, prostatic enlargement, and straining to defecate should be corrected. Surgical or chemical castration can correct the hormonal imbalance and the prostatic enlargement, in the case of benign prostatic hyperplasia or prostatitis. In order to maintain normal defecation dietary changes, laxatives, stool softeners, periodic enemas, and/or manual rectal evacuation can be applied. In case of urinary bladder retroflexion, the bladder can be decompressed using catheterization or cystocentesis. Nevertheless, it is contraindicated to use these treatments as a long-term solution, because life-threatening situations due to organ entrapment and strangulation may occur (Radlinsky 2013, Baines and Aronson 2018).

1.1.7. Surgical Treatment

The goal of PH therapy is the removal of the impacted fecal material from the rectum, the restoration of the herniated viscera to its original place, and the closure of the defect to ultimately reinstall the functionality of the rectum. Several different surgical techniques have been described to fulfill this purpose. These techniques include simple herniorrhaphy and herniorrhaphy incorporating elevation of various muscles, among others, the internal obturator, superficial gluteal, and the semitendinosus muscle. Furthermore, implants involving autologous, allogenic, or even synthetic material such as fascia lata, porcine dermal collagen, porcine/canine small intestinal submucosa or synthetic mesh, are commonly applied in PHR techniques (Burrows & Harvey 1973, Spreull et al. 1980, Weaver & Omamegbe 1981, Chambers & Rawlings 1991, Bellenger et al. 2003, Bongartz et al. 2005, Baines and Aronson 2018, Sukhjit and Barstad 2018). Biomechanical test results showed that fascia lata graft (FLG) and prosthetic implants had a good performance regarding suture pull-out, tensile strength and push-through (Baines and Aronson 2018, Sukhjit and Barstad 2018).

1.1.7.1. One-step vs two-step procedure

It has been reported that in bilateral or complicated PH due to prostatic disease or retroflexion of the bladder, a two-step approach may be beneficial. This technique involves an initial surgery before the PHR surgery. In the first step of this protocol, intact males are neutered and organopexies (colopexy, vas deferenspexy, cystopexy) are performed via a laparotomy approach. A prostatic omentalization may be performed in case of need during this abdominal procedure. In the second step, perineal hernia repair (PHR) is performed about two weeks later (Dupré et al. 1993, Brissot et al. 2004).

1.1.7.2. Traditional Herniorrhaphy (TH)

The reconstruction of the pelvic diaphragm with sutures between the muscles of the perineum to close the herniation by apposition of the tissues is called traditional herniorrhaphy (TH). To begin, sutures are preplaced between the eASM, the coccygeus muscle and the levator ani muscle. Continuing ventrally, the sacrotuberous ligament can be incorporated into the

closure. In case of atrophy of the mentioned muscles, the sacrotuberous ligament can be used as the lateral component of the reconstruction. Ventral sutures are placed between the internal obturator muscle, the eASM, and the coccygeus muscle. When all the sutures are in place, they are tied to appose the tissues. Care should be taken not to put excessive tension on the closure (Baines and Aronson 2018).

Muscle appositional techniques result in excessive tension on the eASM and are not recommended if there is muscle atrophy. Complication and recurrence rates range from 28.6% to 61% and from 10% to 45% (Burrows & Harvey 1973, Bellenger 1980, Brissot et al. 2005). Therefore, muscle transposition techniques were developed, to prevent the tension on the eASM following a simple herniorrhaphy.

1.1.7.3. Internal Obturator Muscle Transposition (IOMT)

If compared to TH, the IOMT technique reduces tension on the sutures and distortion of the eASM. This procedure brings additional muscular tissue, which also increases the blood supply and therefore improves the healing process.

For this procedure, the eASM, the levator ani, the coccygeus, and the internal obturator muscle are visualized. Next, the internal obturator muscle is elevated from the ischium by making an incision along its caudolateral border and then using a periosteal elevator to carefully start elevating the caudal part of the muscle, but not further than the caudal edge of the obturator foramen. Before continuing laterally, the internal obturator tendon should be identified. Its three bands, which merge along the ventrolateral surface of the muscle and become a single band arching lateral to the ischium, are very characteristic. This tendon can be transected medial to the point where it crosses the body of the ischium. The entire elevation of the muscle should include a tough layer of periosteum to improve the suture holding power. Subsequently, the muscle is then transposed dorsomedially to close the hernial defect. Thereafter the procedure follows the same technique used in the traditional herniorrhaphy - once more starting by preplacing all the sutures between the muscles and in conclusion tying them. It is advised not to put too much tension on the sutures. The IOMT

procedure has been recommended for more severe or bilateral PH (Baines and Aronson 2018, Sukhjit and Barstad 2018).
Published complication rates for IOMT range from 12% to 45% (Sluijs & Sjollema 1989, Brissot et al. 2005) whereas recurrence rates range from 2.4 to 36% (Weaver & Omamegbe 1981, Sluijs & Sjollema 1989, Hosgood 1995, Brissot et al. 2005).

1.1.7.4. Superficial Gluteal Muscle Transposition (SGMT)

The IOMT is a very effective technique for PHR. Nevertheless, when performing surgery on bigger dog breeds it may be found that the internal obturator muscle is not long enough to give an adequate closure of the herniation. In these cases, a SGMT is an adequate technique for PHR.
For this procedure, the cutaneous incision stretches from the ASM to the thigh to visualize the superficial gluteal muscle. Next, the contents of the hernia are returned to the abdominal cavity. The hernial sac is ligated, and the remaining fat and omentum are removed. Following this step, the superficial gluteal muscle is identified, originating at the sacrum, with attachments to the gluteal fascia and the sacrotuberous ligament and then inserting below the biceps muscle at the trochanter tertius. Its insertion is where it is cut and subsequently elevated, including a part of the tensor fasciae lata muscle to reassure the proper coverage of the ASM. The superficial gluteal muscle is then placed with its muscle belly covering the ischiorectal fossa, and its broad tendon is stitched to the eASM. At this point care must be taken not to damage the anal sac that lies underneath. After this, the belly of the muscle is stitched to the adjacent tissue making sure that the closure is complete.
Complication rates range from 15% to 58% with recurrence rates of up to 36% (Spreull and Frankland 1980, Weaver & Omamegbe 1981, Brissot et al. 2005).
Compared with other PHR surgery techniques, the SGMT has additional hazards due to having a relatively large wound, and in addition a longer surgery and exposure time than other techniques. Therefore the risk of tissue desiccation and contamination is higher (Spreull and Frankland 1980, Sukhjit and Barstad 2018).

1.1.7.5. Semitendinosus Muscle Transposition (SMT)

Besides the IOMT and the FLG the semitendinosus muscle transposition (SMT) is a well-respected procedure for more severe, ventral, or bilateral PHs. The SMT is also used as a salvage procedure when other surgical techniques have failed. It has been found that the semitendinosus muscle is expendable due to synergistic muscles and therefore can be utilized to fill a PH. Two different manners of transposition have been described. For its usage on the ipsilateral side, it is transposed 180 degrees dorsally. Furthermore, it can be used to fill a hernia with a ventral defect on the contralateral side, if transposed 90 degrees.
Compared to the previously mentioned surgical techniques, in this procedure the skin incision needs to be prolonged distally and therefore ends caudomedially on the ipsilateral or the contralateral side, between the knee and the ankle of the hind limb. The next step is to isolate the semitendinosus muscle from its surrounding structures and then transect it at its midbelly or, if more length is needed, it may also be transected more distally. Subsequently this muscle flap is sutured to the sacrotuberous ligament and the coccygeus muscle. Furthermore, it is sutured to the eASM, internal obturator muscle, ischiourethralis muscle, the pelvic fascia, and the periosteum of the ischium.
A modified technique has been reported where not the entire muscle is used. In this technique the semitendinosus muscle, from the contralateral side of the PH, is bluntly split longitudinally into two parts. Then the medial part of the muscle is transected, and the developed muscle flap transposed in a dorsomedial direction. It passes the rectum ventrally and then goes up to the contralateral ischiorectal fossa (Baines and Aronson 2018, Sukhjit and Barstad 2018).

1.1.7.6. Biomaterial Implants

1.1.7.6.1. Fascia Lata Graft (FLG)

In veterinary medicine the use of FLG has been reported for the treatment of various medical conditions. In dogs FLG has been used for cranial cruciate ligament repair (Buquera et al. 2002), as a substitution of the femoral head ligament to stabilize the coxofemoral articulation (Brandão et al. 2002), for the repair of urethral defects (Atalan et

al. 2005), for the complete replacement of the patellar ligament (Gemmill und Carmichael 2003) and for the repair of PH (Bongartz et al. 2005). Also modified fascia lata (FL) techniques have been described (Semiglia et al. 2011, Guérios et al. 2017).
Regarding PHR the use of autogenous (Bongartz et al. 2005, Guérios et al. 2017) and allogenous (Semiglia et al. 2011) FL has been reported.
For the procedure utilizing autogenous FL, first the FL must be gathered from the lateral thigh. Subsequently to the cutaneous incision the subcutaneous tissue is bluntly prepared to expose the entire surface required for the graft. Next, the two sheets of FL need to be incised using as margins the tensor fascia lata muscle, the sartorius muscle, the cranial border of the biceps femoris muscle and the level of the distal third of the femur. After harvesting, the FLG is stored in a sterile sponge soaked in saline solution until further usage. Then the wound is sutured, and the patient is positioned correctly for the closure of the PH.
Moving onwards, the surgical site of the pelvic diaphragm is prepared so that all the pelvic muscles needed can be visualized. Subsequently to the PH reduction, the FLG is placed apposing the eASM. Starting ventrally the FLG is sutured to the pelvic muscles. The graft should be sutured under tension so that it retains the pelvic and/or abdominal viscera and supports the rectal wall (Bongartz et al. 2005).
In another study the use of allogenous FL has been described. For this procedure the FLG was previously harvested from selected dogs, which all weighed more than 15kg and had not been dead for more than six hours. The cause of these dogs' death was not of an infectious or oncologic cause. They were also free of collagenopathies or any other traumatic matters affecting the muscles needed for the FLG. The lifted graft was then stored in 75 % glycerol for not more than 6 months until the PHR surgery took place. The PHR was performed in a similar way to the one described by Bongartz et al. 2005 (Semiglia et al. 2011).

1.1.7.6.2. Porcine/Canine Small Intestinal Submucosa and Porcine Dermal Collagen

A few clinical reports described porcine/canine small intestinal submucosa (SIS) and porcine dermal collagen as possible implants.

The procedure for these implants is similar to the ones described above, though here horizontal mattress sutures were recommended (Baines and Aronson 2018, Sukhjit and Barstad 2018).

1.1.7.7. Prosthetic Implants

Yet another described technique for PHR is to incorporate synthetic prosthetic implants such as propylene or polypropylene-poliglecaprone mesh in the reconstruction of the pelvic diaphragm. Once more, the procedure starts with the preplacement of the sutures, in the same way as in the traditional herniorrhaphy technique. Then the mesh is cut and tapered appropriately to fit in the pararectal fossa. Next, it is inserted into the fossa and placed correctly, so that the edge is adjacent to the ASM. Subsequently the mesh is attached, and any excess of the mesh is trimmed. Before skin closure the subcutaneous tissue is apposed to cover up the mesh. The use of prosthetic implants is recommended in cases of severe muscle atrophy, large defects or as a rescue technique, if other techniques have failed to secure a proper closure of the PH (Baines and Aronson 2018, Sukhjit and Barstad 2018).

1.2. Objectives and Hypothesis

We conducted a literature research to gather information about prior studies involving perineal hernias and the surgical techniques used for their reparation. Looking back at table 1 a heterogenic distribution of recurrence rates of perineal hernia can be observed. Furthermore, a deficiency of detailed information regarding side of recurrence in bilateral and unilateral hernia can be detected. The present retrospective study evaluates the overall recurrence rate of perineal hernia in unilateral and in bilateral disease. We describe frequency of recurrence in unilateral hernia treated with unilateral repair and the incidence of new hernia formation on the contralateral side, regardless of the applied technique. We hypothesize a low incidence of maximally 20 %. In addition, we report the long-term outcome of the use of fascia lata graft as a rescue technique in the repair of perineal hernia.

2. Materials and Methods

2.1. Literature overview

Literature searching was performed using the online database of PubMed (https://pubmed.ncbi.nlm.nih.gov) and the online database of the library of the University of Veterinary Medicine Vienna via vetmed:seeker (https://www.vetmeduni.ac.at/bibliothek/).
We predominantly searched for papers regarding the FLG and the IOMT technique as those two are the main techniques used at the University of Veterinary Medicine Vienna. We also explicitly searched literature for FLG studies as, up to this date, the FLG technique is still poorly researched.
Our search string in the databases included the key words: Perineal hernia in dogs, internal obturator muscle transposition, fascia lata graft and herniorrhaphy.

2.2. Data acquisition

The surgery texts of the patient database (TIS) of the small animal teaching hospital of the University of Veterinary Medicine Vienna was searched for the term: "Perinealhernie" (translated to English: perineal hernia) between 01.01.2005 and 31.12.2019. 85 patients were identified, that underwent PHR in this time period.
Collected data included patient ID, breed, sex, weight, age, neuter status, side of PH, surgical PHR technique, performance of a two-step or single-step procedure, date of surgery, hospitalization time, complications, recurrence, new hernia formation, time period until recurrence appeared, follow-up time, status of the patient at the end of the follow-up time. In case of bilateral hernia occurrence and subsequent bilateral repair, the surgery was counted as two procedures. In unilateral PH only the affected side was treated. Regarding the recurrence in patients with unilateral PHR we differentiated between those developing PH on the ipsilateral side, classifying this as a recurrence, and those developing a PH on the contralateral side, which we considered a new hernia formation (NHF).
An EXCEL sheet (Microsoft, Version 16.16.27) was used for data preparation.
Following the initial data collection, a telephone survey was conducted to gain more follow-up, predominantly from the patients who had no or uncomplete medical records. 44/85 owners of

patients were successfully contacted, and 41/85 (48.2 %) agreed to participate in the survey. Either they received a questionnaire by mail to fill out by themselves or it was completed over the phone. The owner questionnaire (Attachment 1) was developed according to pre-existing information in the literature and modified according to our needs (Bongartz et al. 2005, Semiglia et al. 2011, Grand et al. 2013, Shaughnessy and Monnet 2015, Guérios et al. 2017).
Three attempts were made on different days and at different times of the day to reach each owner. The information gathered by the telephone survey was then added to the EXCEL sheet, with the information previously obtained from the TIS.

2.3. Classification of complications

The complications were categorized using the Clavien-Dindo classification scheme which was previously used in other retrospective veterinary studies (Dindo et al. 2004, Morgan et al. 2020). This scheme encompasses 5 grades. Grade 1 describes any minor deviation from normal postoperative course, not needing invasive interventions but only medication consisting of antiemetics, analgesics, antipyretics, diuretics, and electrolytes. Grade 2 complications require medical interventions other than those outlined in grade 1, including blood transfusions or total parenteral nutrition. Grade 3 complications need surgical, endoscopic, or radiological interventions. Grade 4 are life-threatening complications leading to a single-organ or multiorgan dysfunction. Grade 5 complications result in the death of the patient. Even though, the previous studies did not use this scheme for long-term outcome we applied this grading system to long-term complications.

2.4. Statistical analysis

Using descriptive statistics, via Microsoft Excel (Microsoft, Version 16.16.27), we assessed the short- and long-term outcome and complications of the different PH surgery techniques as well as the recurrence rate. The recurrence rate between unilateral and bilateral PHR was compared using a chi-squared test (R Core Team 2022). (Reference: R Core Team (2022). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. (URL https://www.R-project.org/.)

3. Results

Surgeries from 85 patients were available for analysis. This resulted ultimately in a total of 122 PHR procedures. Using the TIS we had short- and long-term information available for 80/85 patients. From the telephone survey, the information for the questionnaire (Attachment 1) from 41/85 (48.2 %) of the patients could be gathered. Altogether, we got long-term information from 76/85 patients.

3.1. Breed distribution

Regarding the breeds, 31 of the patients were mixed breed and the remaining were distributed as shown on Table 2.

Table 2 Breed distribution of patients undergoing perineal hernia repair surgery.

Breed	Number of patients
Mixed breeds	31
Other pure breeds*	12
Maltese	11
Chihuahua	5
Dachshund	4
German Shepherd	4
Yorkshire Terrier	4
American Staffordshire Terrier	3
Pekinese	3
Collie	2
French Bulldog	2
Havanese	2
Pomeranian	2

**Other pure breeds included one of each: Austrian Pinscher, Barsoi, Border Collie, Bracke, German Spaniel, Magyar Vizsla, Pit Bull Terrier, Shepherd Collie, Tibet Spaniel, Tibet Terrier, Weimaraner and West Highland White Terrier.*

3.2. Age distribution

The median age of the patients undergoing initial PHR surgery was nine years, with a range from four to 15 years. The age distribution is shown on Fig. 1.

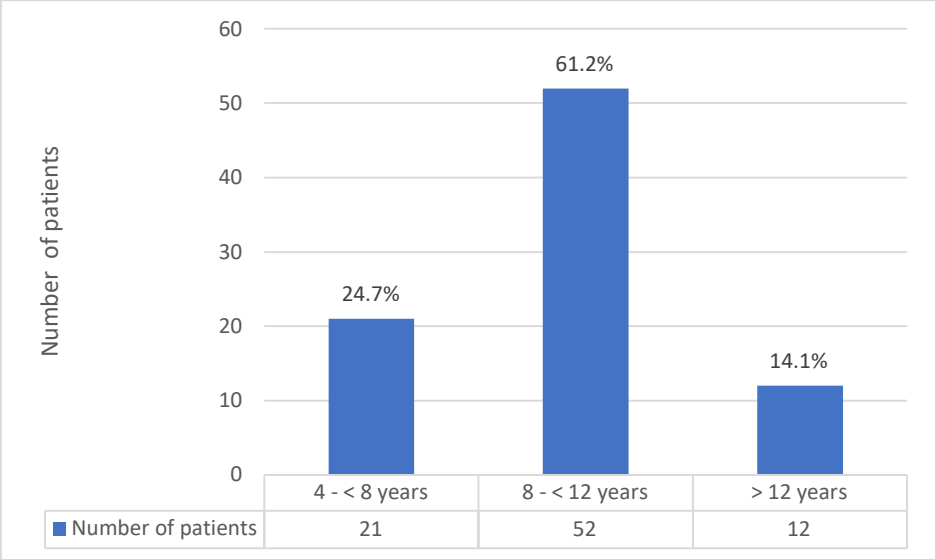

Figure 1 Age demographics of 85 patients undergoing perineal hernia repair

3.3. Sex distribution

Thirteen of 85 patients, 13/85 (15.3 %) were neutered and 72/85 (84.7 %) were intact prior to PH formation. All sexually intact patients were castrated either at the time of the PHR or prior to PHR as part of a two-step approach.

3.4. Occurrence of hernia: unilateral or bilateral

Considering the side of the PHs 48 (56.5 %) were unilateral and 37 (43.5 %) were bilateral. Regarding the patients undergoing unilateral repair, 6/44 (13.6 %) had a recurrence, and 4/44 (9.1 %) had a NHF. Patients receiving bilateral PHR showed higher recurrence rates than those affected unilaterally, with 12/64 (18.8 %) procedures developing a recurrence. The difference was not significant ($p = 0.48$).

3.5. Surgical techniques

The operation techniques used included IOMT, FLG and TH.

A total of 122 first line PHR procedures were conducted. Of these 122 procedures 103 (84.4 %) were IOMTs, 13 (10.7 %) FLGs, four (3.3 %) THs, and the remaining two (1.6 %) were mixed techniques where first a IOMT was performed and then an FLG was added for further support. The distribution of the repair methods used is shown on Fig. 2.

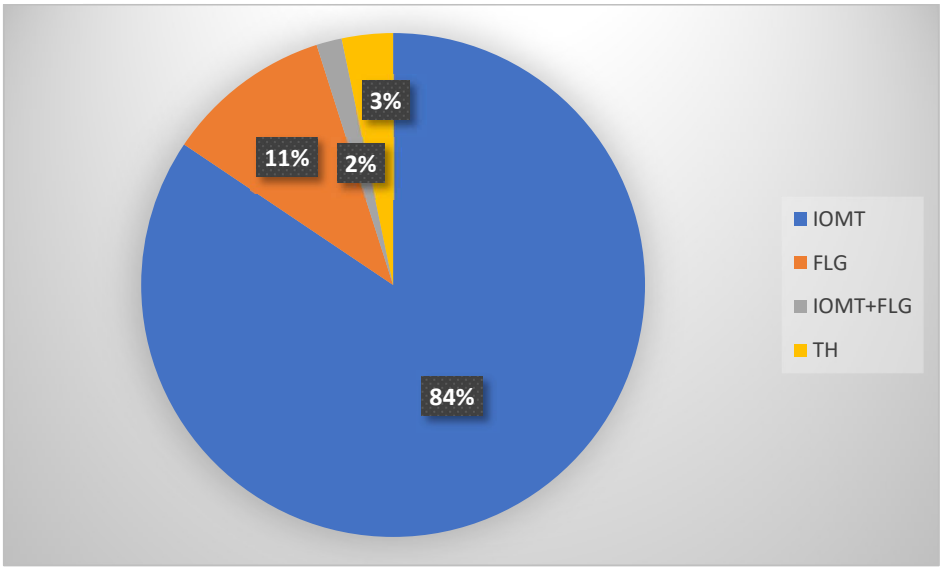

Figure 2 Repair method in 122 procedures

IOMT: Internal Obturator Muscle Transposition, FLG: Fascia Lata Graft, TH: Traditional Herniorrhaphy

3.5.1. Fascia lata graft (FLG) as a rescue technique

We had four patients were the FLG technique was used as a rescue technique after a recurrence occurred. All four patients had previously undergone a PHR were the IOMT technique was executed. Two patients had an unilateral recurrence and two patients had a bilateral recurrence. The median follow up time after rescue PHR surgery involving FLG was 39 months (range 16–56 months). Regarding the post-operative short-term complications 3 of the patients had grade 1 complications and 1 had grade 2 complications

due to a constriction of the urethra. As for the long-term complications two patients had no long-term complications and one had grade 1 complications. The remaining patient had grade 5 complications due to development of another recurrence followed by euthanasia.

3.5.2. Two-step protocol

A two-step protocol was carried out in 62 of the 85 patients. Mostly the two-step procedure was performed at the first appearance of the PH but in four cases it was performed after they were presented with a recurrence of the PH.

3.6. Follow-up

Short-term follow-up was available for 80/85 patients, via medical records. Long-term follow-up, via medical records or phone contact, was available of 76/85 patients.

If counted by number of procedures, short-term follow-up for 113/122 procedures and long-term follow-up for 108/122 procedures was available. Sorted by type of surgery, we had short-term follow-up for 94/103 IOMT, all 13 FLG and four herniorrhaphies, and both mixed technique procedures, as well as long-term follow-up of 90/103 IOMT, all 13 FLG, all four herniorrhaphies and one/two of the mixed technique procedures. The long-term follow-up of the IOMT technique was from 52/62 procedures originating from bilateral PH and 38/41 procedures originating from unilateral PH.

The median long-term follow-up for all surgery techniques was 33 months (range 1–87). For IOMT an average long-term follow-up of 36.1 months (range 1–87months) and for FLG an average long-term follow-up of 20.8 months (range 1–61) was available.

3.7. Complications

In the first month after the surgery, 71/80 patients showed no or mild short-term complications including wound swelling and redness, seroma or hematoma formation, short-term hematochezia, diarrhea, tenesmus and one case of mild lameness post FLG. Nine/80 patients showed more severe short-term complications like suture dehiscence, abscess, or fistula formation and rectal prolapse.

Regarding the long-term follow-up, 54/76 patients developed none or mild complications like episodes of diarrhea or constipation and tenesmus. 22/76 of our patients developed more severe complications, involving a recurrence, a NHF, or in one case, the persistence of the PH.
The distribution of short-term complication for the 64/69 IOMT and the nine FLG surgeries using the Grades of the Clavien-Dindo classification scheme is shown on Table 3.

Table 3 Grades complications short-term

	Grade 0 (Number / per cent)	Grade 1 (Number / per cent)	Grade 2 (Number / per cent)	Grade 3 (Number / per cent)	Grade 4 (Number / per cent)	Grade 5 (Number / per cent)
IOMT	22(34.4 %)	35(54.7 %)	1(1.6 %)	6(9.4 %)	-	-
FLG	4(44.4 %)	3(33.3 %)	-	2(22.2 %)	-	-

IOMT: Internal Obturator Muscle Transposition, FLG: Fascia Lata Graft

The distribution of long-term complication for the 61/69 IOMT and all nine FLG surgeries, using the Grades of the Clavien-Dindo classification scheme is shown in Table 4.

Table 4 Grades complications long-term

	Grade 0 (Number / per cent)	Grade 1 (Number / per cent)	Grade 2 (Number / per cent)	Grade 3 (Number / per cent)	Grade 4 (Number / per cent)	Grade 5 (Number / per cent)
IOMT	32(52.5 %)	12(19.7 %)	-	15(24.6 %)	-	2(3.3 %)
FLG	6(66.7 %)	1(11.1 %)	-	2(22.2 %)	-	-

IOMT: Internal Obturator Muscle Transposition, FLG: Fascia Lata Graft

3.8. Recurrence

From the 76/85 patients with long-term follow-up, 18 developed PH recurrence. The median time period until the recurrence appeared was 10.5 months (range 0–79 months). Regarding the procedures there were a total of 18 recurrences, 12/18 originating from a bilateral hernia and 6/18 originating from an unilateral hernia. The total recurrence rate of all procedures was 16.7 %.
The following table shows the distribution of the recurrences concerning the 108 procedures, from which we obtained long-term follow-up.

Table 5 Recurrence distribution of 108 PHR procedures with long-term follow-up

		All techniques	IOMT	FLG	TH
All procedures	Recurrence	18/108 (16.7 %)	15/90 (16.7 %)	1/13 (7.7 %)	2/4 (50 %)
	NHF	4 (3.7 %)	-	-	-
Bilateral hernia	Recurrence	12/64 (18.8 %)	9/52 (17.3 %)	1/6 (16.7 %)	2/4 (50 %)
	-	-	-	-	-
Unilateral hernia	Recurrence	6/44 (13.6 %)	6/42 (14 %)	-	-
	NHF	4/44 (9.1 %)	-	-	-

PHR: Perineal Hernia Repair, IOMT: Internal Obturator Muscle Transposition, FLG: Fascia Lata Graft, TH: Traditional Herniorrhaphy, NHF: New Hernia Formation

3.8.1. New hernia formation (NHF)

Regarding the unilateral procedures a total of four (9.1 %) NHFs occurred on the contralateral, unoperated side. The median time period until the NHFs appeared was 3.5 months (range 3–33months).

3.9. Hospitalization time

The mean hospitalization time for all surgery techniques was 1.6 days. After IOMT the mean hospitalization time was 1.4 days. The majority, 53/73 (72.6 %) patients stayed hospitalized for one day or less and only five/73 (6.9 %) patients stayed in the hospital for three days or longer. For the FLG technique the mean hospitalization time after surgery was 2.8 days. Here the majority, six/12 (50 %) patients stayed one day or less and only two/12 (16.7 %) patients stayed three days or longer. For each technique one patient stayed an unusually long time period due to other reasons that were not associated with the PHR surgery. One IOMT patient stayed eleven days and one FLG patient stayed 19 days. The mean hospitalization time excluding these patients was 1.3 days for IOMT and 1.4 days for FLG.

4. Discussion

The present study evaluates 85 patients with PH disease retrospectively and represents with this number of patients the second largest retrospectively studied group (Table 1) in the pertinent literature. Even though various methods of surgical treatment of PH exist, in our study three methods were used or a combination of them. Most cases were treated with IOMT and a smaller number with FLG or TH. The findings regarding the short- and long-term outcome of the concerning patients are delivered and evaluated.

Demographic data with regards of age, gender, breed of our cohort is similar to other studies. Regarding the distribution of the dog breeds, we had 31 mixed breeds and eleven Maltese dogs. The allocation of these two breeds may be more representative for the dog population common in this area than for being characteristic for PH disease, as PH can affect any dog.

The age of the studied patients when the PH appeared, supports the results of prior studies with a mean age of nine years (Hosgood et al. 1995, Radlinsky 2013, Sukhjit and Barstad 2018), as 61.2 % of our patients were between eight and twelve years of age.

Concerning the sexual status of the patients, our results corroborate data of prior studies (Burrows and Harvey 1973, Bellenger 1980, Hosgood et al. 1995). 84.7% of our patients where not castrated before the PH appeared. This percentage is slightly higher than the 83% described by Hosgood et al. (Hosgood et al. 1995), and supports the claim that sexually intact male dogs are at a higher risk to develop a PH than their castrated compeers (Burrows and Harvey 1973, Bellenger 1980, Hosgood et al. 1995). Castration is part of the current therapy strategy of PH (Baines and Aronson 2018). All patients of our study were either castrated during the surgical therapy or were neutered prior to that following the two-step protocol.

Surgical complications may be classified in intraoperative complications and postoperative complications. The latter ones are most often subdivided in short-term and long-term complications. For an objective description of the occurred complications, we opted to use a scheme adopted from human medicine according to Clavien-Dindo (Dindo 2004), which already was used in other veterinary studies (Morgan et al. 2020).

Looking at our findings in respect to the complication grades, our short-term follow-up results show a similar distribution of percentages in the different grades for the FLG technique and the IOMT technique, both having no individuals that had a higher grade than Grade 3 following the Clavien-Dindo scheme. Moreover, for both techniques, most individuals had Grade 0 or Grade 1 short-term complications with 89.1 % in the IOMT group respectively 77.8 % in the FLG group. For the long-term complications most patients had Grade 0 or Grade 1, 72.1 % IOMT and 77.8 % FLG.

Comparing the short- and long-term follow-up of these techniques is not conclusive because we only had nine patients who underwent the FLG technique.

In this patient cohort, the FLG technique was used mostly as a salvage procedure after failed PHR or as an augmentation in an IOMT procedure, and was not the first-choice method for PHR. The slightly worse outcome of the FLG technique can be explained with its use as a salvage technique in individuals with accentuated muscle atrophy and/or severe cases of PH were IOMT alone was considered inadequate. Even though, the numbers of our FLG patients cannot be properly compared with the numbers of our IOMT patients, they do show that it is an acceptable salvage technique and that future investigations for this technique are recommendable.

Although, PH is commonly considered a bilateral disease (Radlinsky 2013, Baines and Aronson 2018, Bernardé 2018) our results show a different finding. The recurrence rate after unilateral PHR (13.6 %) displayed by our dog group was lower than the recurrence rate after bilateral PHR (18.8 %). Even though this difference is not significant ($p = 0.48$). Only four/44 of our patients with unilateral PHR had a NHF on the contralateral side. This means that only 3.7 % of the patients developed a NHF on the unoperated side. With that in mind a prophylactic bilateral PHR as recommended in previous studies (Bernardé 2018) should be second-guessed.

Considering the hospitalization time after the surgery our initial results for the average hospitalization time after the FLG technique was quite higher than expected due to one individual that had to stay a longer period due to reasons not related to the PHR surgery. Regarding the hospitalization time after the IOMT procedure, there also was one patient that had a longer stay but, due to the higher number of patients it did not compromise the results as much as it did for the FLG technique. Including these two patients the mean hospitalization time is 1.4 days for

IOMT and 2.8 days for FLG. If we exclude these two patients the mean hospitalization time is 1.3 days for IOMT and 1.4 days for FLG. Again, the slightly longer stay of the patients who had FLG is probably due to the severity of their PHs and the low number of individuals who had this technique.

In conclusion our results show that the FLG technique is a solid technique for PHR, but further research with a larger number of treated dogs should be undertaken to obtain a better understanding of the short- and long-term benefits of this technique compared to other surgery techniques. The approach of an a priori prophylactic bilateral PHR in every dog with PH should be reconsidered according to our results.

5. Summary

The objective of this retrospective study was to report the recurrence rate of unilateral and bilateral perineal hernia repair with the hypothesis that recurrence in unilateral hernia treated with unilateral repair, affects the contralateral side at the most in 20 % of cases, ultimately resulting in a new hernia formation on this previously judged normal side. In addition, we present the short- and long-term outcome of the operation techniques internal obturator muscle transposition and fascia lata graft for perineal hernia repair.

Evaluation of medical records of patients with perineal hernia repair from December 2005 until June 2020 of the veterinary teaching hospital of the University of veterinary medicine Vienna, Austria, yielded 85 patients. Recurrence and long-term outcome were assessed via medical records and a telephone survey. Descriptive statistics were used to evaluate the findings.

A total of 122 procedures were evaluated, each bilateral surgery was counted as two procedures. 48 (56.5 %) surgeries were unilateral and 37 (43.5 %) were bilateral. From 108/122 procedures, long-term follow-up was obtained. The total recurrence rate was 16.7 % which supports our hypothesis. Six/44 (13.6 %) procedures with unilateral repair and twelve/64 (18.8 %) procedures with bilateral repair developed a recurrence. Four/44 (9.1 %) of our patients with unilateral perineal hernia repair displayed a new hernia formation on the unoperated contralateral side. There were 103/122 internal obturator muscle transposition and 13/122 fascia lata graft procedures with long-term follow-up from 90/103 internal obturator muscle transposition and from all 13 fascia lata graft procedures. The average long-term follow-up time for internal obturator muscle transposition was 36.1 months (range 1–87months) and for fascia lata graft 20.8 months (range 1–61 months). Internal obturator muscle transposition had 15/90 (16.7 %) and fascia lata graft had one/13 (7.7 %) recurrences. Sixty-two/85 patients underwent two-step procedures involving first castration and cysto-, vas deferens- and/or colopexy and approximately two weeks later the hernia repair.

In conclusion, our study revealed a low number of contralateral new hernia formation in unilateral perineal hernia treated unilaterally. This indicates reconsideration of the thought of perineal hernia as bilateral disease with prophylactic bilateral repair in every patient.

6. Zusammenfassung

Das Ziel dieser retrospektiven Studie war es die Rezidivrate von unilateralen und bilateralen Perinealhernienreparaturen zu untersuchen. Unsere Hypothese ist, dass in unilateraler Hernie, therapiert mit unilateraler Reparatur, in höchstens 20 % der Fälle die Bildung einer neuen Hernie auf der gegenüberliegenden Seite auftritt.

Außerdem präsentieren wir die kurz- und langfristigen Ergebnisse der Operationstechniken, Transposition des inneren Obturator Muskels und Transplantation der Fascia Lata zur Perinealhernienreparatur.

Die Krankenakten von Patienten mit Perinealhernienreparaturen von Dezember 2005 bis Juni 2020 des veterinärmedizinischen Lehrkrankenhauses der Veterinärmedizinischen Universität Wien wurden ausgewertet und ergaben 85 Fälle. Rezidive und langfristige Ergebnisse wurden mittels Krankenakten und einer telefonischen Umfrage kontrolliert. Mithilfe deskriptiver Statistik wurden die Ergebnisse ausgewertet.

Insgesamt wurden 122 Perinealhernienreparaturen evaluiert. Bilaterale Operationen wurden als zwei Reparaturen gezählt. In Zahlen waren 48/122 (56.5 %) Reparaturen unilateral und 37/122 (43.5 %) bilateral. Von 108/122 Reparaturen konnte ein langfristiges Follow-up erhalten werden. Zugunsten unserer Hypothese war die totale Rezidivrate 16.7 %. Bei 6/44 (13.6 %) Operationen mit unilateraler Reparatur und 12/64 (18.8 %) bilateralen Reparaturen entwickelte sich ein Rezidiv. Bei 4/44 (9.1 %) unserer Patienten mit unilateraler Reparatur entwickelte sich eine neue Hernie auf der nicht operierten, kontralateralen Seite.

Es gab 103/122 Transpositionen des inneren Obturator Muskels und 13/122 Transplantationen der Fascia Lata. Die restlichen 6/122 wurden mithilfe anderer Operationstechniken behandelt. Wir haben langfristiges Follow-up von 90/103 Transpositionen des inneren Obturator Muskels und von allen 13 Transplantationen der Fascia Lata. Die durchschnittliche langfristige Follow-up Zeit von der Transposition des inneren Obturator Muskels war 36,1 Monate (1–87 Monate) und von der Transplantation der Fascia Lata 20,8 Monate (1–61 Monate). Die Transpositionen des inneren Obturator Muskels hatten 15/90 Rezidive (16.7 %) und die Transplantationen der Fascia Lata hatten 1/13 (7.7 %) Rezidiv. Bei 62/85 Patienten wurde ein zweistufiges Verfahren durchgeführt, bei welchen zuerst eine Kastration gemeinsam mit einer Zysto-, Samenleiter-

und/oder Kolopexie vorgenommen wurde, und etwa zwei Wochen später die Perinealhernienreparatur.
Zusammenfassend zeigt unsere Studie eine geringe Anzahl von kontralateraler neuer Hernienbildung bei unilateraler perinealer Hernie, welche einseitig repariert wurde. Dies deutet darauf hin, dass der Gedanke einer Perinealhernie als bilaterale Erkrankung mit prophylaktischer bilateraler Reparatur, bei jedem Patienten überdacht werden sollte.

7. List of abbreviations

eASM – external Anal Sphincter Muscle

IOMT – Internal Obturator Muscle Transposition

FLG – Fascia Lata Graft

FL – Fascia Lata

NHF – New Hernia Formation

PH – Perineal Hernia

PHR – Perineal Hernia Repair

SGMT – Superficial Gluteal Muscle Transposition

SIS – Small Intestinal Submucosa

SMT – Semitendinosus Muscle Transposition

TH – Traditional Herniorrhaphy

TIS – Tierspitalinformationssystem (Animal hospital information system)

8. Attachments

A. Questionnaire (translation)

- What applies?

Your animal had a perineal hernia for some time, which was then operated.

Had a perineal hernia for some time and then the condition suddenly got worse and required immediate surgery.

The perineal hernia appeared suddenly and was operated immediately.

.

The animal has previously had perineal hernia surgery.

- If yes: When did the recurrence occur?

Where has the animal been operated previously?

at our hospital
external facility

- Was the animal castrated before the perineal hernia appeared?

It was neutered during the surgery
It was already neutered before

- Has your dog shown pain after the perineal hernia repair surgery?

yes no not sure

- If yes: strong middle mild

- How did this pain express itself?

_____

- Was any medication given to relieve the pain?

  yes no

- How long did it take for you animal to be pain free again?

_____

- Were there any problems with the healing of the surgical wound?

  yes no

- If yes, which?

  Temperature around the wound was higher
  Area around the wound was swollen
  Area around the wound showed redness
  Sutures came apart
  Increased wound discharge
  other _____

- Did your animal have problems with defecation after the surgery?

yes no

- If yes, which?

Strain to defecate
(The dog tries to defecate but the feces only comes after a prolonged time interval or not at all; dog has pain while defecating, e.g. whimpering, growling)

strong middle mild

Blood in the stool

strong middle mild

No excrement / constipation

strong middle mild

Episodes of diarrhea

strong middle mild

Fecal incontinence

strong middle mild

- Did your dog have problems urinating after the surgery?

  yes no

  - If yes, which?

  Strain to urinate
  (The dog tries to urinate but the urine only comes after a prolonged time interval or not at all; dog has pain while urinating, e.g. whimpering, growling)

  strong middle mild

  Blood in the urine

  strong middle mild

  Urine incontinence

  strong middle mild

  Urinary tract infections

  strong middle mild

- Did your dog have any other problems after the surgery that have not been mentioned before?

_____

_____

- If you ticked one or more of the above complications:

  - How long after the surgery did the complication appear?

    _____

  - Did the complication occur once o more often?

    once more often

  - If more often: How often?

    _____

- Did the complication need treatment or did it get better on its own?

  treatment no treatment was necessary

  - If necessary, what treatment did the patient receive?

    Food additives that keep the stool soft
    (e.g. psyllium, lactulose / milk sugar)

    others:

    _____

    _____

    _____

  - Was it a short-term or long-term therapy?

    short-term therapy / episodic therapy
    long-term therapy

- How long did it take for your dog to recover?

- Did the perineal hernia develop a recurrence?

  yes no

  - If yes:

    same side other side

  - How long after the surgery did the recurrence occur?

    _____

  - Did your animal need another perineal hernia repair surgery?

    yes no

- If your animal is no longer alive, did it die or was it euthanized as a result of complications due to the perineal hernia?

  yes no not sure

- If your animal is no longer alive, what was the cause for its death / euthanization?

_____

_____

- If your animal is no longer alive, when did it die / when was it euthanized?

_____

B. Fragebogen Perineal-Hernien

- Was trifft zu?

Ihr Tier hatte seit längerem eine Perinealhernie, die dann geplant operiert wurde.

Hatte seit längerem eine Perinealhernie und der Zustand hat sich plötzlich verschlechtert und eine Operation war sofort notwendig.

Die Perinealhernie ist plötzlich aufgetreten und wurde sofort operiert.

Das Tier wurde bereits schon einmal wegen einer Perinealhernie operiert

- Wenn ja: In welchem zeitlichen Abstand ist das Rezidiv aufgetreten?

- Wo wurde das Tier bereits operiert?

in unserem Hause
externe Einrichtung

- War das Tier bereits vor der Operation kastriert?

Es wurde im Laufe der Operation kastriert
Es war bereits kastriert

- Hat Ihr Hund nach der Perinealhernienoperation Schmerzen gezeigt?

	Ja	Nein	Nicht sicher
- Wenn ja:	stark	mittel	leicht

- Wie haben sich diese Schmerzen geäußert?

_____

- Wurde eine Medikation zur Besserung der Schmerzen verabreicht?

Ja Nein

- Wie lange hat es gedauert bis ihr Tier wieder schmerzfrei war?

_____

- Gab es Probleme bei der Heilung der Operationswunde?

Ja Nein

- Wenn ja welche?

Wundumgebung war höher temperiert
Wundumgebung war angeschwollen
Wundumgebung war gerötet
Nähte sind aufgegangen
Vermehrter Wundausfluss
Andere _____

- Hatte Ihr Tier nach der Operation Probleme beim Kotabsatz?

  Ja Nein

  - Wenn ja, welche:

  Pressen auf Stuhl
  (Hund versucht Kot abzusetzen aber der Kot kommt erst nach einem verlängerten Zeitintervall oder nur wenig bzw. nichts; Hund hat Schmerzen beim Kotabsatz, z.B. Winseln, Brummen)

  stark mittel leicht

  Blut im Stuhl

  stark mittel leicht

  Kein Absatz von Kot / Verstopfung

  stark mittel leicht

  Episoden von Durchfall

  stark mittel leicht

  Kotinkontinenz

  stark mittel leicht

- Hatte Ihr Hund nach der Operation Probleme beim Harnabsatz?

  Ja Nein

  - Wenn ja, welche:

  Pressen auf Harn
  (Tier versucht Harn abzusetzen, allerdings kommt Harn erst nach verlängertem Zeitintervall oder nur geringe Menge oder nichts; Tier hat Schmerzen beim Harnabsatz, zeigt z.B. Winseln, Brummen)

  stark mittel leicht

  Blut im Harn

  stark mittel leicht

  Harninkontinenz

  stark mittel leicht

  Harnwegsentzündungen

  stark mittel leicht

- Hatte Ihr Hund andere, bisher nicht genannte, Probleme nach der Operation?

_____

_____

_____

- Falls sie eine oder mehrere der oben genannten Komplikationen angekreuzt haben:

    - Wie lange nach der Operation sind die Komplikationen aufgetreten?

      _____

    - Sind die Komplikationen einmalig oder öfters aufgetreten?

      einmalig öfter

    - Falls öfter: Wie oft?

      _____

- Musste die Komplikation therapiert werden oder ist es von selbst wieder besser geworden?

      Therapie keine Therapie nötig

    - Wenn ja, welche Therapie wurde gegeben?

      Futterzusatzmittel, welches Kot weich hält
      (z.B. Flohsamen, Lactulose / Milchzucker)

      andere:

      _____

      _____

      _____

- Handelte es sich um eine kurzfristige- oder eine Dauertherapie?

  kurzfristige Therapie / episodenweise Therapie
  Dauertherapie

- Wie lange hat es gedauert bis Ihr Hund wieder gesund war?

- Ist es im weiteren Verlauf zu einem Wiederauftreten der Perinealhernie gekommen?

  Ja Nein

  - Wenn ja:

    selbe Seite andere Seite

  - Wie lange nach der Operation?

  - Musste Ihr Tier erneut operiert werden?

    Ja Nein

- Falls Ihr Tier mittlerweile nicht mehr lebt – ist es an den Folgen oder den Komplikationen der Perinealhernie gestorben oder wurde es deswegen euthanasiert?

  Ja Nein Nicht sicher

- Falls Ihr Tier nicht mehr lebt, woran ist es verstorben?

_____

_____

- Falls Ihr Tier nicht mehr lebt. Wann ist es gestorben / euthanasiert worden?

_____

9. List of tables and figures

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