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Case Report

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# Partial Phallectomy for the Treatment of Penile Squamous Cell Carcinoma in a 25-Year-Old Gelding

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## Abstract

Squamous cell carcinoma (SCC) is the most common neoplasm affecting the external genitalia of male horses, in particular aged geldings. This case report describes the surgical management of a large SCC of the glans penis of a 25-year-old gelding using the Williams partial phallectomy technique. The gelding presented with a swollen prepuce with foul-smelling discharge and abnormal micturition. Physical examination revealed an ulcerative mass eroding the glans penis, and cytology indicated squamous epithelial dysplasia with septic neutrophilic inflammation. Based on the lesion's characteristic cauliflower-like appearance and cytological findings, SCC was suspected and surgical excision was decided. Partial phallectomy according to Williams was performed, selected for its indication for masses invading the *tunica albuginea* whilst allowing for shorter anaesthesia time due to the gelding's advanced age. Palpation and ultrasonography of inguinal lymph nodes were unremarkable and lymph node resection was not included in the treatment plan. Postoperative histopathological examination indicated a well-differentiated SCC with vascular and lymphatic invasion though. The horse recovered well with no complications and normal urination one month after surgery. However, three months post-operatively, recurrence was suspected due to preputial sheath enlargement and abnormal ultrasonographic findings, indicative of a metastatic process. This report highlights the challenges associated with the management of equine penile SCC, particularly in aged horses, and the importance of early detection. Williams partial phallectomy proved to be practical and effective, offering a satisfactory short-term outcome. However, the risk of recurrence remains a significant concern and owners need to be aware of the guarded prognosis.

**Keywords:** Equine penile squamous cell carcinoma; Equine squamous cell carcinoma; Partial phallectomy; Williams partial phallectomy; Horse

## Introduction

Neoplasia in horses is not uncommon and the prevalence of its manifestation on external genitalia (6-10%) is only second to that of the skin among systemically distributing neoplasms [1-4]. The most common type of neoplasms developing on the prepuce and penis of horses are squamous cell carcinomas (SCC), accounting for 49-82.5% of cases, followed by squamous papillomas (SP), melanocytic tumours, lymphomas, sarcoids, haemangiomas, fibrosarcomas and fibromas [2,5-12]. SCC is predominantly observed in aged geldings with the average age of affected horses ranging from 17.4 to 19.5 years [13-16]. Also, breeds with lightly pigmented or unpigmented skin on the prepuce and the penis have an increased likelihood of developing SCC

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[2,17]. Squamous cell carcinoma typically presents as focal or multifocal, slightly raised erosions or shallow ulcers, progressing into cauliflower-like solid masses, with necrotic ulcerated bleeding surfaces that cavitate the underlying tissues. It should be noted that SCC may resemble cutaneous habronemiasis and should be differentiated from it, as the habronemiasis lesions are benign, and can be managed conservatively when at an early stage [18-19]. The most common sites for SCC development are the glans penis and the internal laminae of the prepuce [2,5,13,20-21]. SCC is insidious in its development and although of low-grade malignancy, it can spread to deeper structures such as the *corpus spongiosum*, the *corpus cavernosum* and the urethral mucosa of the penis. SCC can invade lymphatic and corporeal vessels leading to metastasis in the inguinal lymph nodes and internal organs, respectively [17]. Despite not being rare, neoplasms of the external genitalia can go undetected for a long period before horse owners become aware of them and refer the horse to a veterinarian. This can often lead to a guarded prognosis for the horse and a challenging treatment plan for the veterinarian. Treatment options for SCC in horses depend on its location and extent and can be nonsurgical, including cryosurgery and topical use of 5-fluorouracil, or surgical ranging from local excision to segmental posthioplasty (reefing), partial phallectomy (with or without sheath ablation) and *en-bloc* penile and preputial resection with penile retroversion and lymph nodes resection, when a significant part of the penis has been compromised and lymph node metastasis is suspected [2,15,22-24]. Regardless of the surgical method, SCC has an 11-28% chance of recovering, which is a critical factor influencing prognosis. Infiltration of the inguinal lymph nodes and *corpus cavernosum* with neoplastic cells signal a poor prognosis, as radical surgical intervention is required, and haematogenous spread of the neoplasm cannot be prevented [20-21]. The aim of this report is to describe a case of partial phallectomy using the Williams technique, under short anesthesia time, in an aged gelding with SCC of the glans and body of the penis and highlight the challenge of recurrence and the importance of early diagnosis which establishes the prognosis.

## Case history

A 25-year-old Warmblood gelding was presented to the Equine Unit of the Veterinary Clinic of the Aristotle University of Thessaloniki, with a history of a swollen prepuce and impaired micturition and a foul odour emanating from the prepuce. A week prior to admission the gelding had undergone treatment for a suspected balanoposthitis which included a course of antibiotics (marbofloxacin 2 mg/kg IV S.I.D. for 5 days, Marbocyl® 10% Inj.) and washes of the preputial orifice with a mild antiseptic solution (5% chlorhexidine solution), followed by local application of an antibiotic ointment (Cloxalene Plus®). The horse did not seem to improve and was referred to the clinic.

## Clinical findings

On presentation, physical examination of the gelding was within normal limits except for the prepuce which appeared oedematous. Inspection of the preputial orifice revealed malodorous sanguinopurulent discharge and the gelding was sedated to examine its penis (detomidine 0.02 mg/kg IV, Detonervin®10 mg/ml, butorphanol 0.02 mg/kg IV, Dolorex® 10 mg/kg). Protrusion of the penis following sedation was unsuccessful even after gentle manual traction and only the outer lamina of the inner preputial fold could be externalised, where multiple circular ulcerative plaques could be noticed. Examination of the glans penis through the preputial ring, though only partial, revealed an eroded glans penis with presence of erythema and severe ulcerative lesions, and a firm ulcerative mass spanning the glans and body of the penis could be palpated. At that time, superficial swabs of the glans penis were collected through the preputial ring for cytology. Following sedation, the gelding urinated and dysuria was noted as well as urine coming out at multiple angles rather than in one single stream (Figure 1). On palpation, the regional lymph nodes did not appear enlarged, and ultrasonography of the preputial sheath and superficial and deep inguinal lymph nodes revealed no abnormal findings. Finally, haematology and biochemistry were unremarkable apart from elevated white blood cells (10.2 K/μL, reference range 5.5-7.5 K/μL).

**Figure 1:** The gelding's urination as depicted coming out in multiple angles rather than one single stream, suggesting a compromised urethral process.

## Cytology

Cytologic examination of superficial swabs from the glans penis revealed a high number of squamous epithelial cells singly scattered or arranged in small and larger tight clusters over a haemorrhagic background. The cells displayed mild anisocytosis and anisokaryosis with occasional nucleated and anuclear polygonal cells. In addition, the sporadic presence of both degenerate and non-degenerate neutrophils was noted as well as an abundance of bacilli and cocci, few of which were

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phagocytosed by neutrophils. In view of the above, dysplasia of squamous epithelium with concomitant septic neutrophilic inflammation was deduced, although the presence of a well-differentiated SCC could not be excluded.

## Diagnosis and treatment plan

Based on the ulcerative appearance and location of the mass, and the dysplastic squamous cells reported on cytology, a tentative diagnosis of SCC of the glans penis and shaft was made. Despite the guarded prognosis and the high percentage of recurrence associated with SCC tumours, the owner elected the excision of the mass accepting the possibility of a palliative rather than curative outcome. Following a comprehensive evaluation of the extent of the mass intraoperatively and considering the absence of abnormal findings on the ultrasonography of the sheath and lymph nodes, the gelding's advanced age and the financial burden for the owner, a partial phallectomy according to Williams [25] was selected without lymph node resection or sheath ablation.

## Surgery

The horse was starved for 12 hours preoperatively and following general anaesthesia (GA) was positioned in dorsal recumbency. Under GA, the penis was protruded and the urethral process and glans penis showed severe erosion, and extensive lesions were observed over the remaining surface of the glans penis characterised by ulcerated, cauliflower-like growths. The mass measured approximately 15 x 5 cm extending from the glans penis to the body of the penis, was firmly adherent to the integument and appeared to infiltrate tissues through to the urethra at places. The prepuce, penis and the inguinal region were prepared for surgery and the whole penis was also dipped in alcohol for further antisepsis. The surgical field was draped, and the penis extended using a gauze tied centrally to the severely damaged glans penis (Figure 2). The bladder was catheterised and a Penrose drain was placed as a tourniquet proximally to the planned site of transection to minimise bleeding.

**Figure 2:** Examination of the penile mass under general anaesthesia revealed a large ulcerative mass at the distal end of the penis invading the corpus spongiosum, urethra, tunica albuginea and corpus cavernosum, severely eroding the glans penis and urethral process of the gelding's penis.

Partial phallectomy was performed following the Williams technique [25]. A triangular section of tissue, 4-cm-wide at the base and 6-cm-long at the sides, that included epithelium, fascia, bulbospongiosus muscle and *corpus spongiosum* penis without entering the urethral lumen, was removed from the ventral surface of the penis starting where the edge of the mass could be palpated, with the apex of the triangle facing proximally on the penis. After that, a longitudinal incision, from the base to the apex of the triangle, was made on the midline of the exposed urethra to reveal the urethral catheter. Simple interrupted polyglactin sutures (COATED VICRYL® No. 2/0) apposing the urethral mucosa and the respective triangle's epithelial edge were then placed to create a new urethral lumen. The base of the triangle was left unsutured at this stage. The catheter was removed and the affected glans penis transected in an oblique craniodorsal direction, starting from the base of the triangle. Minor haemorrhages were controlled with electrocautery and ligation with polyglactin absorbable sutures (COATED VICRYL® No. 2/0). The penile stump was closed in a single layer using seven simple interrupted sutures of polydioxanone (PDS™ I Suture) with each suture bite containing the urethral mucosa, *tunica albuginea* of the *corpus spongiosum*, *tunica albuginea* of the *corpus cavernosum* of the penis and the penile epithelium. Placement of the sutures started at the middle of the stump with the first suture, whilst the second and third sutures were placed at the middle of each half of the stump created by the first suture and so on with each suture placed at the site of bisection of each half created by the previous suture (Figure 3). The tourniquet was then loosened and the tissues checked for haemorrhage. Finally, the urethral mucosa at the basis of the triangle was sutured to the penile epithelium with simple interrupted polyglactin sutures (COATED VICRYL® No. 2/0). To assist with post-operative urination, the urinary catheter was reinserted and secured to the abdominal skin,

**Figure 3:** Placement of the simple interrupted sutures during the closure of the penile stump bisecting one half of it.

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with the Roman sandal technique using polypropylene non-absorbable sutures (PROLENE® No. 0).

## Histopathology

Formalin fixed samples from different locations of the excised tumour were submitted for histopathology. At tissue dissection, the samples were firm and white with sparse vaguely lobular or irregular white, grey to brown-grey areas and a small number of dark brown-black spots. Histopathologically, the samples were partially covered by hyperplastic epidermis with moderate to severe hyperkeratosis, which was multi-focally ulcerated. The dermis was completely effaced by an infiltrative tumour consisting of round to polygonal cells arranged in variably sized trabeculae, cords and nests, and moderate to abundant fibrous stroma with extensive desmoplasia and a heavy inflammatory infiltrate with mononuclear cells, macrophages and numerous neutrophils. The neoplastic cells had well-defined cell borders, abundant granular to glassy eosinophilic cytoplasm, and a round to oval vesicular nucleus with finely stippled chromatin and 1-3 prominent nucleoli, and they often showed progressive keratinization towards the center of the neoplastic structures which included partially keratinized and dyskeratinized forms. The larger structures contained luminal keratin (keratin pearls) or accumulations of dyskeratotic and necrotic cells. There was moderate to severe cellular atypia, pleomorphism and anisocytosis, and readily identifiable mitoses, with occasional mitotic atypia (Figure 4). Vessel invasion by tumour cells was rare but evident. The histomorphology of the tumour was typical of a highly invasive, conventional, well-differentiated squamous cell carcinoma.

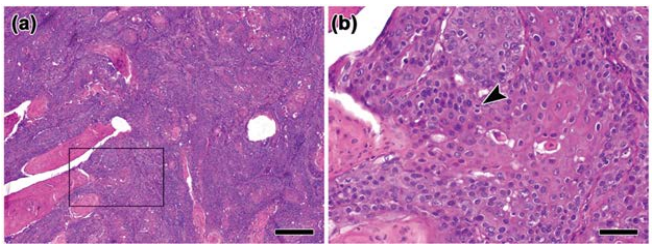


**Figure 4:** Histological (Hematoxylin and Eosin-stained) features of penile SCC of the horse: (a) Representative histopathology of the well-differentiated squamous cell carcinoma showing trabecular, cord and nest architecture and central amorphous keratin formation (keratin pearls). (b) The boxed area in (a) is shown in higher magnification to depict cellular features of malignancy including cellular atypia, pleomorphism, anisocytosis and mitotic figures (arrowhead). Hematoxylin and Eosin. Scale bars: 250 µm (a) and 50 µm (b).

## Post-operative care

Postoperatively, flunixin meglumine (1.1 mg/kg IV B.I.D., Niglumine® 50 mg/ml) was administered for five days followed by 0.5 mg/kg B.I.D. after the fifth day for another 5 days, since the horse showed only minor discomfort. Marbofloxacin (2 mg/kg IV S.I.D., Avicolam® 100 mg/ml,) was administered for 7 days and daily topical application of an antibiotic ointment (Cloxalene Plus®) on the preputial orifice ameliorated the accompanying balanoposthitis. Mild swelling of the prepuce was initially observed postoperatively as well as the occasional blood drop but no substantial haemorrhage (Figure 5). Repeat biochemical analysis revealed creatinine levels within normal range (1.3 mg/dL; reference range 1.2 - 1.8 mg/dL).

**Figure 5:** Post-operative picture of the gelding showing mild swelling of the prepuce and traces of blood around the preputial lamellae.

## Follow up and outcome

One month after the surgery, over a telephone enquiry, the horse was healthy with normal micturition and no evidence of discomfort. However, after three months of post-surgery the horse was readmitted due to an enlarged preputial sheath which obstructed the preputial orifice. Clinical examination revealed a hard sheath on palpation. Protrusion of the penis for examination was not possible despite sedation. Ultrasound examination of the penile sheath revealed a hypoechoic parenchymatous mass with increased blood flow and poorly defined margins, indicative of invasion into adjacent structures. The regional lymph nodes were enlarged and hypoechoic. Increased blood flow as assessed with Doppler ultrasonography was evident in both the mass in the sheath and the lymph nodes. These ultrasonographic findings were suggestive of metastasis but following a discussion with the owner further diagnostic modalities or surgical management were excluded.

## Discussion

SCC is the most common neoplasm affecting the prepuce and penis of older geldings [2-3,12]. In its initial stages, it can often go unnoticed by owners with negative consequences on treatment options and outcome, highlighting the importance of regular genital examinations in older geldings. Clinical signs accompanying penile SCCs include oedema of the

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prepuce, sanguineous or purulent discharge, pungent odour when secondary infections are present, and disturbed micturition, with larger SCCs also interfering with normal protrusion and retraction of the penis [26]. In this case, normal protrusion of the gelding's penis was disrupted and as a result the presenting complaint on admission was a swollen malodorous sheath despite the large ulcerative SCC of the distal penis that had invaded the *corpus spongiosum*, *tunica albuginea*, *corpus cavernosum* as well as urethra at places and had eroded the urethral process and most of the gelding's glans penis. The gelding resisted penile protrusion even following sedation with detomidine for penile examination and a comprehensive evaluation of the penis and the extent of the mass was only conducted following GA for the surgical excision of the mass. Acepromazine can also be used for relaxation of the retractor penis muscle [2,21] nevertheless, it was not selected for the penile examination in this case as it is also associated with complications such as penile prolapse and priapism [27-28]. The differential diagnosis of a penile mass in horses includes neoplasms and excessive granulation tissue (primary or secondary to habronemiasis or neoplasms). The most common penile neoplasm of the horse is the SCC but penile melanomas, lymphomas, sarcoids, haemangiomas and fibromas are also encountered, and there are sporadic reports of penile basal cell carcinoma, neurofibrosarcoma, adenocarcinoma and fibrosarcoma [6-8,13-14,16,29]. Pathological evaluation following a fine needle aspiration biopsy or a punch biopsy, more reliably, is required for the final diagnosis of penile masses as well as to provide information about prognosis. However, frequently, when the lesion is so severe that complete excision is necessary independent of final diagnosis, or the gross appearance of the mass is consistent with common neoplasm types and financial or clinical challenges are present or, surgical removal or debulking are performed and histopathology is carried out postoperatively [13,30]. In the present case, an SCC was suspected but mass accessibility did not allow for harvesting of a representative biopsy for histopathology. Instead, the mass on the glans penis was swabbed for cytology which revealed dysplasia of the squamous epithelium consistent with an SCC. Furthermore, the severity of the clinical presentation led to the decision to surgically excise the mass independent of final diagnosis. Upon suspicion of a penile neoplasm, ultrasonography can aid in the evaluation of its size and degree of invasion [9] which needs to be considered when establishing a treatment plan and communicating prognosis. More specifically, for penile SCC, the presence of invasion into the *tunica albuginea*, *corpus cavernosum*, and the urethra are associated with recurrence due to the risk of haematogenous spread and risk of underestimating the extent of the neoplasm by palpation and subsequent incomplete excision [31]. Here, due to its notable swelling, the sheath of the gelding was examined by ultrasonography which on initial presentation revealed diffuse oedema but no evidence of preputial masses. Metastatic involvement should also be considered when suspecting malignant neoplasms, such as the SCC. The first lymph nodes to be affected by metastasis in equine penile neoplasms are the superficial and deep inguinal lymph nodes. Here, palpation of the superficial inguinal lymph nodes and ultrasonography of the superficial and deep inguinal lymph nodes did not reveal enlargement or abnormal findings. However, palpation of lymph nodes can often be challenging when fat deposition is present and absence of lymph node enlargement does not rule out metastasis, with occult metastasis being reported [29]. There are several treatment options for penile SCC [32] including non-surgical options, such as cryotherapy, topical chemotherapy with 5-fluorouracil [33] intralesional administration of cisplatin [33-34], and radiotherapy [34-42], and surgical options. Surgical management of SCC ranges from local excision, segmental posthetomy (reefing), partial phallectomy (with or without sheath ablation), to the more radical *en-bloc* penile and preputial resection with penile retroversion and inguinal lymph node resection [2,15]. The treatment plan depends on the location and size of the neoplasm, its invasiveness, differentiation grade, and presence of metastases, as well as factors including the horse's overall health, financial constraints, and availability of equipment or therapeutics. In the present case, the size of the neoplasm and the severity of clinical presentation led to the decision of surgical management the extent of which was decided following a more comprehensive examination of the neoplasm under GA. Under GA, a large firm ulcerative mass involving the distal end and most of the free part of the penis was observed. The neoplasm appeared to invade the *corpus spongiosum*, urethra, *tunica albuginea*, and *corpus cavernosum* of the penis resulting in significant erosion of the glans penis and the urethral process. Local excision and segmental posthetomy, which involves the surgical resection of a circumferential segment of the internal preputial lamina, are the preferred surgical procedures for neoplasms that do not invade the *tunica albuginea* of the penis [42]. Since the SCC in this case had invaded all deeper structures of the penis, a more radical approach involving penile amputation, such as partial phallectomy (with or without sheath ablation) and *en-bloc* penile and preputial resection with penile retroversion, was required. *En-bloc* penile and preputial resection with penile retroversion and inguinal lymph node resection involves the resection of a large part of the penis, the entire prepuce and the inguinal lymph nodes followed by retroversion of the penis and creation of a stoma ventrally to the anus. It is indicated when lymph node metastasis has occurred or when the neoplasm has invaded the penis' *corpus cavernosum* and urethra, like the SCC in this case report. However, the *en-bloc* penile and preputial resection with penile retroversion is more commonly associated with more serious complications such as severe haemorrhage, cystitis, prolonged wound

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infection and dehiscence with second intention healing of the urethral stoma [31,42]. In addition, *en-bloc* penile and preputial resection with penile retroversion requires a significantly longer anaesthetic time and is associated with a greater financial cost. The gelding in the present case was older and, although he was in good health, anaesthetic time was a significant concern. Beyond the advanced age of the gelding and the increased risk of serious complications, the cost of the procedure was also prohibitive for the owners. A partial phallectomy was therefore elected for the surgical management of the gelding's penile SCC. Partial phallectomy can be carried out according to Scott's [43], Vinsot's [44-45], or Williams' [25] techniques. Scott's procedure involves a circumferential transverse incision and resection of the body of the penis or prepuce, leaving a 5 cm segment of urethral mucosa free of other tissues, to revert and suture back on the penile or preputial epithelium and the underlying *tunica albuginea.* To the authors' knowledge, this technique encompasses the risk of urethral stricture, as the urethral mucosa is stretched, folded back and sutured at the end of the penis, without creating a functional urethrostomy. This can cause irregular healing and formation of fibrotic tissue, leading to stricture of the urethral opening and secondary urinary problems such as dysuria or complete obstruction and post-renal azotemia. Vinsot's procedure is one of the simplest techniques of phallectomy, where a triangular section of tissue including skin, fascia, bulbospongiosus muscle, and *corpus spongiosum* penis is excised from the ventral aspect of the penis, approximately 4-5 cm proximal to the intented transection site. The main disadvantage of this technique is the tendency for urethral stricture but also the risk of developing urine-induced contact dermatitis, which are associated with the direction of the apex of the triangle, which is pointing distally [46]. These complications are minimised with the Williams' technique, which was selected for this case [47]. In this technique the apex of the triangle is facing proximally, allowing the base located at the site of penile transection, to form a broader stoma. This facilitates normal urine outflow and reduces the risk of urine stagnation within the preputial sheath. SCC recurrence following partial phallectomy is not uncommon [20-21]. This is possibly due to the limited amount of penile tissue that can be removed; as the annulus of the inner laminae of the penis is the proximal border up to which a partial phallectomy is tolerated, to minimise the risk of wound dehiscence associated with resection at a more proximal location [31]. When performing the Williams technique, if the SCC is too close to the resection site, its excision with adequate margins might not be possible. However, histopathology of the margins of excision of the neoplasm can aid to ensure complete excision of the neoplastic tissue [30] and to decide if additional therapy is necessary, be it surgical or chemotherapeutic [48]. In the present case, the amputation site appeared clear of the SCC margins but three months post-operatively, the gelding was readmitted due to an enlarged preputial sheath which revealed neoplastic tissue in the sheath and inguinal lymph nodes on ultrasound. Post-excision histopathological examination of the SCC in the present case did not involve the SCC margins but it indicated neoplastic infiltration of the penile blood and lymphatic vessels, suggesting potential metastasis to the inguinal lymph nodes and systemic circulation. Metastasis occurs in 12.5% of SCCs [21] and primarily spreads via lymphatic and vascular circulation, with the latter potentially affecting internal organs only in advanced disease [17,49-50]. Pre-operatively, palpation and ultrasonography of the lymph nodes did not reveal any abnormal findings, however occult metastasis to regional lymph nodes has been reported previously [29]. In retrospect, it could be argued that the SCC's invasion of the penis' *corpus cavernosum* and urethra or a pre-operative biopsy might have directed us towards an *en-bloc* resection with penile retroversion and inguinal lymph node resection or the use of chemotherapeutic agents at the excisional margins of the SCC following partial phallectomy. However, the owner's financial constraints, the age-related anaesthetic considerations, and the limited availability of chemotherapeutic agent-based preparations, like cisplatin-based preparations, precluded us from considering the *en-bloc* resection with penile retroversion and inguinal lymph node resection or adjunct therapies with local chemotherapeutic preparations, respectively. Therefore, despite the guarded prognosis, taking into consideration the risk of severe complications linked to more invasive procedures, the challenges associated with the age of the gelding, the owner's financial constraints and the availability of equipment and chemotherapeutic agents, the Williams partial phallectomy is a surgical procedure which results in good reconstruction of the urethral stoma, does not require lengthy anaesthesia, and is associated with fewer complications compared to other procedures of penile amputation. Its combination, however, with adjunct non-surgical and surgical procedures, such as local chemotherapy and lymph node resection, might reduce the recurrence rate of SCC [51].

## Conclusions

In conclusion, penile SCCs can often go unnoticed for a long period until they grow large or cause disturbance from a malodorous discharge. The glans penis is the most common site for SCC neoplasms and partial phallectomy can be selected when the annulus of the penile integument is intact and no further metastasis has occurred. However, occult metastases and incomplete excision are known to occur. Therefore, following surgery, the borders of the excised mass should be submitted to histopathology for confirmation of absence of neoplastic tissue and the penile stump and adjacent tissues and lymph nodes should be monitored for neoplasia recurrence or metastasis. Finally, it is important that owners

are aware of the guarded prognosis of surgical intervention even when the SCC is excised with clean borders and there is no evidence of lymph node involvement.

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