

A review of the history, epidemiology and treatment of squamous cell carcinoma of the scrotum

Jerome E. Azike^{1,2}

¹Department of Surgery, College of Medicine and Health Sciences, Imo State University, Orlu, Campus; ²Imo State University Teaching Hospital, Orlu, Imo State, Nigeria

Abstract

Squamous cell carcinoma of the scrotum is a tumor that is of interest for clinical and historical reasons. It was the first cancer linked to occupational exposure when, in 1775, Percivall Pott described it in chimney sweeps in England. Other occupations that had a preponderance of the disease included people who worked with the distillates of coal and men exposed to mineral oil. Currently, the disease is very rare and most cases are thought to result from poor hygiene and chronic irritation. Surgery with a negative resection margin offers the best hope of cure as adjunctive therapy has not proved useful. Prognosis correlates with the extent of nodal involvement.

Introduction

The scrotum is a seven-layer pouch which covers the testes, testicular adnexae, and distal spermatic cord. These layers are the epidermis, dermis, tunica dartos, the three layers of Colles' fascia and the parietal layer of the tunica vaginalis.¹ The scrotal lymphatics drain into the corresponding superficial inguinal lymph nodes. Anastomoses to the lymphatics of the contralateral network across the median raphe occur. Testicular lymphatics drain to the para-aortic nodes.

Tumors have been reported to arise out of virtually any of the components of the scrotal wall.² Both benign and malignant tumors of the scrotum are rare.¹ Squamous cell carcinoma of the scrotum is now very rare; the incidence has been reported to be less than 10 cases per year in the United States.² Squamous cell carcinoma is the most common malignant tumor of the scrotum; however, rare cases of basal cell carcinoma, melanoma, Paget's disease and sarcoma have been reported.³ Secondary tumors of the scrotum can occur; for instance, carcinoid tumor of the small bowel can metastasize to the scrotum simulating a primary

scrotal tumor.¹

Squamous cell carcinoma of the scrotum is a tumor that is of interest for clinical and historical reasons. It has been identified as a sentinel health event (occupational) [(SHE(0))].⁴ Synonyms include epidermoid carcinoma of the scrotum, chimney sweepers cancer, mule-spinners cancer and epithelioma of the scrotum. It is customary to give priority for the description of the disease to Bassius who described it in 1731, but it was Percivall Pott who in 1775 described its occurrence in chimney sweeps in Pott's *Chirurgical Observations*, thereby making him the first to attribute an occupational cause to the disease. This also established scrotal cancer as the first described occupational cancer.^{1,2,5} Squamous cell carcinoma of the scrotum has historically been associated with exposure to occupational (industrial) and non-occupational (environmental) carcinogens. From the eighteenth century, there have been at least three broad occupational groups with a preponderance of the disease: chimney sweeps, people who work with the distillates of coal, and men exposed to mineral oil. The common hazard in these occupations arises from polycyclic aromatic hydrocarbons in soots, tars and mineral oils.⁶ In these industries, improved technology or the decline of the industry have led to less men being affected. Chimney sweep cancer was commoner in England, as cases were virtually unknown in other parts of Europe or America; attention to personal hygiene had for long been the practice among the continental sweeps. The introduction of protective clothing at work and improved personal hygiene reduced the incidence of chimney sweep cancer in England.

The first public notice that the distillation of coal might induce cancer of the scrotum was given by Von Volkman at the Third Surgical Congress in Berlin in 1873. Tar from gas works blast furnaces, and coke ovens was used widely from the end of the nineteenth century, both in the original state and for the distillation of a series of hydrocarbons which included creosote, anthracene and naphthalene. The etiology of the disease was unclear from the time of Pott until 1922, when Passey gave experimental evidence of the presence of weak carcinogens in soot, as the theory of chronic irritation popular at the time did not fully answer all the questions raised. Men exposed to mineral oil included shale oil workers and engineering workers exposed to cutting oils. Unrefined or mildly refined mineral oils have substantial levels of polycyclic aromatic hydrocarbons and their use in industries such as printing and metalworking in the past has led to skin cancers.⁵ The hazard has remained but newer circumstances may now be involved. Engine oils have elevated polycyclic aromatic hydrocarbon content with use; prolonged and repeated con-

Correspondence: Jerome E. Azike, Department of Surgery, College of Medicine and Health Sciences, Imo State University, Orlu, Imo State, Nigeria.
E-mail: jeazike@yahoo.com

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tact with used engine oil can cause skin and scrotal cancer. Car mechanics are at potential risk from used engine oils.⁷ Best occupational health practices are invaluable to minimize exposure at the work place. The establishment of the concept of latent period in tumor induction in the last century helped shed light on the observation by several writers that the scrotal lesion appeared many years after the man had left the job associated with squamous cell cancer or when he was in another trade altogether. In this respect, Henry Earle and Curling noted the disease appearing after intervals of 15 years and 19 years, respectively.⁵ Other non-occupational factors that may be associated with the disease include prior history of cancer, PUVA (psoralen-ultraviolet light) treatments, radiotherapy, poor personal hygiene and treatment with arsenical compounds.^{3,5,8,9} Case reports exist which correlated squamous cell carcinoma of the scrotum with human papilloma viruses, mainly oncogenic types 16 and/or 18 or 6/11^{8,10,11} but a direct causal relationship has not been established. Squamous cell carcinoma of the male genitalia may be multifocal,¹² especially when oncogenic human papillomavirus types are present.¹⁰

Patients frequently delayed seeking medical help,⁵ mainly due to embarrassment, ignorance or both; that the initial lesion is usually slowly growing and painless may also be contributory. In a case series of 9 patients, M^c Donald reported that the interval between patient awareness of the lesion to diagnosis averaged 3.3 years.¹³ In a case series of 19 patients seen between 1948 and 1971, Ray and Whitmore found the interval before presentation was 26 months.⁹ However, in earlier reviews the interval between onset of symptoms and treatment was reported to have been about 10-12 months.⁹ This may suggest that as the disease became less common, the interval between onset of symptoms and presentation increased.

The patients afflicted with chimney sweeps cancer were generally young men. Writing in 1832, Henry Earle considered that the majority of cases were in patients between the ages of 30 and 40. Green analyzed 36 cases pooled from the eighteenth and nineteenth century literature and found the mean age of presentation was 37.7 years.⁵ However in the series by Ray and Whitmore, which involved cases seen between 1948 and 1971, the average age was 56 years; the majority occurred in the 5th to 7th decade of life.⁹

Squamous cell carcinoma of the scrotum frequently present as a solitary wart or nodule on the scrotum. There seems to be no predilection for any side, if patients with occupational cancer are excluded.⁹ Superficial ulceration may follow increase in size or the effect of scratching at the lesion. Ulcerated lesions may have a sero-sanguinous discharge that may become profuse and foul-smelling if infected. If an ulcer is present, it is a malignant squamous ulcer and would have features expected of such. There may be ipsilateral or bilateral inguinal lymph node enlargement which may be inflammatory or neoplastic or both.⁹ In some cases, the growth may become large and grotesque. Pain is usually absent until late stages of the disease. Azike, Chukwujama and Oguike reported on a recent case of squamous cell carcinoma of the scrotum with penile and testicular involvement in a 42-year old who presented with a 10-year history.¹⁴

Spread and metastasis

The lesion tends to remain localized to the scrotal wall, may occasionally involves the adjacent perineal skin but rarely involve the scrotal contents or penis; distant spread is rare.⁹ The pubic bone is occasionally involved by direct extension.^{14,15} In the series of 141 cases, Southan and Wilson found testicular involvement in 6 and penile in 3 cases.¹⁶ Spread is to the inguinal which may be unilateral, bilateral or crossed; iliac nodes, the para aortic nodes, and may reach the lungs. Metastatic involvement has been reported as early as four months or as late as ten years.¹⁷ The iliac nodes may be involved when there is no recognized inguinal involvement.⁹

Primary tumors in other sites

Dean noted the high incidence of multiple primary tumors in patients with scrotal cancer. In his series, 8 of 27 patients had other primary tumor.¹⁷ In the series by Ray and Whitmore,⁸ 9 of 19 patients had another primary tumor.⁹ Weinstein, Howe and Burnett found that 8 out of the 19 cases had prior history of cancer.⁴ Lione and Denholm described a patient who died of stomach cancer two years after treatment for scrotal carcinoma.⁹

Diagnosis

The diagnosis is suggested clinically and is confirmed by wedge biopsy of the edge of the scrotal lesion. Refractory scrotal inflammatory lesions should be biopsied to rule out squamous cell carcinoma. General investigations include full blood count, serum electrolytes urea creatinine estimation, liver function tests, urinalysis, urine culture if indicated, wound swab culture and sensitivity if ulceration is present. There is need for extensive evaluation with appropriate investigative modalities to exclude associated internal malignancy. Staging investigations include abdomino-pelviscrotal ultrasound, MRI of the scrotum, and chest CT.

Staging

Staging of scrotal carcinoma as proposed by Ray and Whitmore.⁹

Stage A

- A1 Disease localized to the scrotum
- A2 Locally extensive disease involving adjacent structures (penis, perineum, testis and/or cord structures, pubic bone) by continuity but without evident metastasis.

Stage B

Regional* metastasis, resectable

Stage C

Regional metastasis, non-resectable

Stage D

Distant metastasis (beyond regional nodes)

**Inguinal or ilioinguinal*

Treatment

The established treatment for squamous cell carcinoma of the scrotum is wide excision with a 2-3 cm margin. Surrounding subcutaneous tissue should be excised with the primary tumor. Resection of the scrotal contents is rarely necessary for tumor control unless involved by tumor.^{3,9} Intra-operative frozen sections may help to confirm a disease free margin. Primary scrotal closure is usually possible, but may be a challenge after large tumor resection. Many investigators have reported various methods to cover a healthy testis when primary closure is not feasible. These include immediate use of local thigh flaps,¹⁸ myocutaneous gracilis or adductor minimus myocutaneous flaps, and heterologous fascia grafts.^{19,21}

Other investigators place the exposed testis in the subcutaneous tissue of the thigh or femoral region or do ipsilateral orchidectomy.^{15,22,23} Others do contralateral testicular transposition following a hemiscrotectomy.²⁴ Local recurrence may occasionally occur and may be due to insufficient tumor resection or may represent new lesions.^{9,24} Adjunctive treatment like radiotherapy or chemotherapy or both has not proved useful, and only palliation is usually feasible for late stage disease. A multidisciplinary

approach may be necessary to fully address all aspects of patient management.

Treatment of the regional lymph nodes

Briefly, the optimal management of patients with squamous cell carcinoma of the scrotum with clinically negative inguinal node is controversial and involves a decision as to whether a prophylactic or therapeutic node dissection should be performed. Some authors^{15,25} propose bilateral radical groin dissection to remove micrometastasis; the rationale of the contralateral groin dissection being the free communication between the lymphatics of the two sides of the scrotum. Dean emphasized that only 50% of patients with inguinal adenopathy actually had metastases, suggesting that routine dissection would be useful only in half of the patients with inguinal adenopathy. He advocated bilateral groin dissection only for proved metastases.¹⁷ Ray and Whitmore based on their experience, advocated patient follow-up at 2-3 month intervals after excision of primary lesion and to perform an ipsilateral ilioinguinal dissection if there is clinical evidence of metastasis proved by biopsy, and to perform an ipsilateral ilioinguinal dissection if there is clinical evidence of metastasis proved by biopsy, and to defer contralateral ilioinguinal dissection until there is clinical evidence of metastasis. Presti jr. advocated observation for clinically negative lymph nodes, but patients with clinically palpable nodes to be given antibiotics first. If the groin nodes remain clinically palpable, ilioinguinal lymph node dissection is performed. But if it becomes clinically negative after broad spectrum antibiotics, limited node sampling is performed. If positive, ilioinguinal lymph node dissection is performed; if negative observation is continued.³

Prognosis

An important prognostic factor is the ability to completely excise the tumor at the time of initial surgery.² Prognosis correlates with the presence or absence of nodal involvement. If the inguinal nodes are involved the 5-year survival rate is approximately 25%. There are virtually no survivors if the iliac nodes are affected.^{3,9} In a review of a series of 18 patients, Ray and Whitmore Jr found no correlation among the patient age, duration of symptoms, size, histological type or grade of the tumor and survival. However, they reported that patients with high tumor burden had the worst prognosis; no patient with non-resectable metastasis or metastases beyond the inguinal nodes survived.⁹ Patient follow-up is for life.

Conclusions

Squamous cell carcinoma of the scrotum is now a rare clinical entity and it is given only scant attention in most urological textbooks. It is pertinent to once again remind the medical community of the existence of this disease and provide a brief summary of its history, epidemiology and treatment from the literature to add to the resources available to the practising urologists and oncologists.

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