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Anthony kodzo-grey venyo *

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Review Article

Prostatic stromal sarcoma: review and update

Anthony kodzo-grey venyo

Retired urologist; medical examiner member or the royal college of pathologists of london. United Kingdom.

***Corresponding Author:** Anthony kodzo-grey venyo. Retired urologist; medical examiner member or the royal college of pathologists of london. United kingdom.

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Abstract

It has been iterated that the prostate stromal neoplasm originates from mesenchymal components of the prostate gland. Prostatic stromal sarcoma in human beings in 1998, was first classified into 2 types by Gaudin and associates including prostatic stromal sarcoma (PSS) and stromal tumours of uncertain malignancy potential. It has been suggested that PSS was especially rare which only accounts for less than 0.1% of primary prostate malignancies in adults. A number of authors had reported that the common manifestation of PSS was urinary retention and the serum prostatic-specific antigen (PSA) level had often remained within normal range. Nevertheless, with the low incidence of prostatic stromal sarcoma that had been reported, clinical information related to the rare neoplasm has remained not clear. Primary prostate sarcomas are rare, with one study estimating it to comprise of just 0.7% of prostatic malignancies. Prostatic stromal sarcoma typically emanates from specialized hormone-dependant mesenchymal cells of the prostatic stroma. A diverse histopathology pattern of prostatic stromal sarcoma in human beings had been reported in the literature as case reports or few case series, often closely related to stromal tumours of uncertain malignant potential (STUMP). In view of the rarity of the neoplasm, it would be envisaged that majority of clinicians all over the world would not have encountered a case of prostatic stromal sarcoma before. In order to provide updated information of primary prostatic sarcoma of the prostate gland afflicting human beings, it is important for all clinicians who encounter cases of primary prostatic sarcoma to report their cases with long-term follow-up outcome results so that new lessons would be learnt about the tumour.

Keywords: prostatic stromal sarcoma; stromal sarcoma of the prostate gland; prostate biopsy; ultrasound-scan-guided prostate biopsy; serum prostate specific antigen; urinary retention

Introduction

It had been iterated that phyllodes tumour of the prostate gland, which was first described by Cox and Dawson in 1960, is an uncommon neoplasm. [1-2] It had been stated that phyllodes tumour of the prostate gland had been termed by various other names, including: cystic adenoma of the prostate, cyst-adeno-leio-myo-fibroma, cystic epithelial-stromal tumour, phyllodes type of atypical hyperplasia and cysto-sarcoma phyllodes. It had furthermore been iterated that the tumour is histologically similar to phyllodes tumour of the breast with a distinctive biphasic pattern of hyperplastic epithelium-lined cysts, leaf-like intraluminal epithelial-lined stromal projections, compressed and elongated silt-like epithelial-lined spaces, and variable cellular spindle cell stroma, at times with subepithelial condensation with or without atypia. The epithelial lining of the tumour is stated to be typically bland with a secretory cell layer and a basal cell layer. [1] [3]

It has in addition been iterated that the clinical significance and management of prostatic phyllodes tumour are not certain, as well as that the clinical course of the tumour had not been well defined due to the fact that the most reported cases had little or no follow up assessment reported. [1] It had also been stated that majority of reports of the tumour had described the phyllodes tumour as a variant of hyperplasia (phyllodes-type hyperplasia), whereas other cases had been described as malignant phyllodes tumours (cysto-sarcoma phyllodes) based upon the presence of many mitotic figures and prominent cytological atypia. [1] It had been pointed out that the precise criteria for separating benign and malignant stromal tumours of the prostate gland had not yet been clearly defined. In view of the rarity of prostatic stromal sarcoma in human beings that had been so far reported, it would be envisaged that majority of clinicians would not be familiar with the manifestation, diagnostic features, treatment and outcome of prostatic stromal sarcoma. The ensuing article on prostatic stromal sarcoma in human beings has been divided into two parts: (A): Overview, and (B) Miscellaneous narrations and discussions from some case reports, case series and studies related to prostatic stromal sarcoma.

Aim

To review and update the literature on prostatic stromal sarcoma.

Method

Internet data bases were searched, the search words that were used included: Prostatic stromal sarcoma; prostate stromal sarcoma; and stromal sarcoma of the prostate gland. Thirty-five (35) references were identified which were used to write the article on prostatic stromal sarcoma which has been divided into two parts: (A): Overview, and (B) Miscellaneous narrations and discussions from some case reports, case series and studies related to prostatic stromal sarcoma.

Results

[A] Overview

Definition / general

The ensuing summations had been made regarding general aspects of prostatic stromal sarcoma: [4]

- Prostatic stromal sarcoma (PSS) is stated to be a rare entity [5]
    - It has been pointed out that mesenchymal tumours of the urinary bladder and prostate gland are infrequent tumours.
    - Isolated case reports and short series of stromal sarcoma of the prostate gland are being reported gradually in the literature, and the majority of cases had tended to be benign neoplasms.
    - Other than stromal tumour of uncertain malignant potential and prostatic stromal sarcoma, both tumours are stated to be derived from the specific prostatic stroma, the mesenchymal neoplasms in these locations are identical to their counterparts seen in other organs.
    - Nevertheless, the limited amount of tissue which had tended to generated by biopsy and rarity of mesenchymal lesions in these sites has created unique diagnostic difficulties, while correct classification of the tumour had often been associated with a significant impact upon the prognosis as well as treatment strategy.
- It has been iterated that usually prostatic stromal sarcoma has tended to manifest with urinary retention as well as the finding of an abnormal digital rectal examination, haematuria or haematospermia, and also palpable rectal mass
- It has been iterated that prostatic stromal sarcoma also includes phyllodes tumours like phyllodes tumours in the breast [6]

Essential features

The essential features of prostatic stromal sarcoma had been summated as follows: [4]

- Cellular pleomorphism in prostatic stromal sarcoma does tend to exceed that of stromal proliferation of undetermined malignant potential (STUMP)
- Prostatic stromal sarcoma upon pathology examination is demonstrated to contain necrosis within the neoplastic tissue.
- Microscopy pathology examination of specimens of prostatic stromal sarcoma demonstrates evidence of mitotic activity
- Gross and microscopy pathology examination of prostatic stromal sarcoma demonstrates extension of the neoplasm beyond the prostate gland

Terminology

It has been iterated that the ensuing terminologies had tended to be utilised for prostatic stromal sarcoma of the prostate gland: [4]

- Phyllodes tumour of the prostate gland.
- Cystic epithelial - stromal tumour of the prostate gland.
- Cyst-adeno-leiomyo-fibroma of the prostate gland.
- Cysto-sarcoma phyllodes of the prostate gland.

Epidemiology

The epidemiology of prostatic stromal sarcoma had been summated as follows: [4]

- About 30 cases of prostatic stromal sarcoma had been reported in the literature.
- The mean age of individuals who had been afflicted by prostatic stromal sarcoma is 54 years but the ages of individuals afflicted by prostatic stromal sarcoma had ranged between 14 years and 86 years. [7]

Gaudin et al. [7] made the ensuing iteration:

- Sarcomas and related proliferative lesions of the specialized prostatic stroma had been the subject of case reports and, hence, they had not been well characterized.

Gaudin et al. [7] reviewed the clinicopathological features of 22 cases and had studied the immunohistochemical profile of 9 cases. They summarised the results as follows:

- The ages of the patients had ranged from 25 years to 86 years and the mean age of the patients was 54 years, and the peak incidence was in the 6th and 7th decades of life.
- The most common clinical manifestation was urinary retention, followed by abnormal results upon digital rectal examination, haematuria or haematospermia, and a palpable rectal mass.
- The cases were grouped into two categories: prostatic stromal proliferation of uncertain malignant potential (PSPUMP, 18 cases) and prostatic stromal sarcoma (PSS, 4 cases) based upon the degree of stromal cellularity and the presence of mitotic figures, necrosis, and stromal overgrowth.
- Four histopathological patterns of PSPUMP were identified including: (1) hypercellular stroma with scattered cytologically atypical cells associated with benign glands, (2) hypercellular stroma with minimal cytological atypia associated with benign glands, (3) hypercellular stroma with or without cytologically atypical cells, associated with benign glands in a "leaflike" growth pattern that resembled phyllodes tumours of the mammary gland, and (4) hypercellular stroma without cytologically atypical stromal cells and without glands.
- Prostatic stromal sarcoma, upon pathology examination demonstrated greater cellularity, mitoses, necrosis, and stromal

overgrowth in comparison with PSPUMP and had consisted either of stromal elements with benign glands in a pattern that simulated malignant phyllodes tumours of the mammary gland (3 cases) or of purely stromal elements (1 case).

- Positive immunohistochemical reactions were demonstrated utilising vimentin in 9 of 9 cases, CD34 in 8 of 8, HHF-35 in 2 of 8, smooth muscle actin in 3 of 9, desmin in 4 of 8, S-100 protein in 0 of 9, oestrogen receptor in 1 of 7, and progesterone receptor in 6 of 7. None of the cases classified as PSS were positive for HHF-35, smooth muscle actin, or desmin.
- Out of the 13 patients which were classified as having PSPUMP who did not undergo definitive local therapy at the time of diagnosis, recurrent signs or symptoms were seen in six (46%), necessitating additional treatment.
- Distant metastases to lung and bone developed in one patient classified as having PSS. Clinical and pathological findings in this patient had indicated a progression from PSPUMP to PSS.

Gaudin et al. [7] made the ensuing conclusions:

- Sarcomas and related proliferative lesions of the specialized prostatic stroma encompass a spectrum of histological features and might be grouped into two clinicopathology categories: PSPUMP and PSS.
- Based upon their distinctive histopathology examination appearance and immunohistochemical profile, PSPUMP and PSS could be differentiated from other mesenchymal lesions of the prostate gland.
- Nevertheless, the mean age of the patients in 1 study was 37 years, versus 61 years for stromal tumour of malignant potential (STUMP). [8]

Sites

- It has been iterated that prostatic stromal sarcoma could be found within the prostate gland as well as in the peri-prostatic tissue. [4]

Aetiology

- It has been iterated that the aetiology of prostatic stromal tumour is not known. [4]

Clinical features

The clinical manifestations of prostatic stromal sarcoma had been summated as follows: [4]

- The commonest manifestation is urinary bladder outlet obstruction, followed by the finding of abnormal digital rectal examination, haematuria and rectal fullness. [9]
- It had been explained that the inclusion of phyllodes tumour in prostatic stromal sarcoma is justified by its frequent early recurrence, infiltrative growth, extra-prostatic extension and metastatic spread if incompletely excised. [1] [10], [11-12]

Diagnosis

- It has been iterated that to establish the diagnosis of this tumour microscopy pathology examination of specimens of the prostate neoplasm demonstrates cellular pleomorphism, necrosis, mitotic activity, extension outside the prostate and metastasis exclude benign mimics [4]

Laboratory test

- It has been iterated that in cases of prostatic stromal sarcoma biochemistry blood tests demonstrate serum PSA levels that are usually within the normal range. [4]

Radiology examination description

- It had been stated that the prostatic stromal lesion that became metastatic was distinguished by intense uptake on ^{18}F-FDG PET imaging. [4] [13]
- It had been iterated that this high intensity is in contrast to the benign entity of stromal hyperplasia with atypia, also called STUMP. [4]
- It has been iterated that MRI scan of the prostate gland demonstrates a multinodular mass with homogeneous or heterogeneous low signal intensity on T1 weighted imaging and heterogenous high signal intensity on T2 weighted imaging [14]

Prognostic factors

The factors for prognostication of prostatic stromal sarcoma had been summated as follows: [4]

- Low grade stromal sarcoma of the prostate gland could invade locally, whereas high grade stromal sarcoma of the prostate gland has the potential to metastasize. [4]
- Metastatic sites include of prostatic stromal sarcoma had been summated to include the ensuing: [4]
    - The lymph nodes. [14-15]
    - The liver [16]
    - The sub-cutaneous tissue. [17]
    - The bones [4] [13]

Treatment

- It has been iterated that the tumour could be managed by robotic procedure but surgery alone is inadequate [4-15] [18-19].
- It has been stated that the tumour does respond to chemotherapy and radiotherapy [19]

Microscopic (histologic) description

The ensuing summations had been made regarding the microscopy pathology examination features of prostatic stromal sarcoma. [4]

- It has been documented that microscopy pathology examination of specimens of prostatic stromal sarcoma demonstrates greater cellularity, mitotic activity, necrosis and stromal overgrowth in comparison with STUMP. [4]
- It has been documented that microscopy pathology examination of specimens of prostatic stromal sarcoma demonstrates storiform and infiltrative growth pattern. [4]
- It has been documented that microscopy pathology examination of specimens of prostatic stromal sarcoma demonstrates sarcomas which are subdivided into low-grade and high-grade based upon mitotic rate, necrosis and degree of atypia [4] [9]
- It has been stated that microscopy pathology examination of specimens of prostatic stromal sarcoma does tend to show that there may be either stromal elements with benign glands simulating malignant breast phyllodes tumours or pure stromal elements. [4]

Positive stains

It has been iterated that immunohistochemistry staining studies of specimens of prostatic stromal sarcomas demonstrate tumour cells exhibit positive staining for tumour markers as follows: [4]

- **Vimentin** (100%), [4]
- **CD34** (100%), [4]
- **Progesterone receptor** (85%), [4]
- **Desmin** (50%) [4]
- **High Ki67** proliferation index stands are demonstrated in prostatic stromal sarcoma in contrast to **STUMP** [4] [20]

Negative stains

It has been iterated that immunohistochemistry staining studies of specimens of prostatic stromal sarcomas demonstrate tumour cells exhibit negative staining for tumour markers as follows: [4]

- **Smooth muscle actin** [4] (33%) and **HHF35** (25%) may be positive [4]
- S100 (100%)**, ER** (usually), **STAT6** [4] [20]

Molecular / cytogenetics description

The ensuing summations had been made regarding the molecular / cytogenetics features of prostatic stromal sarcomas. [4]

- Both prostatic stromal sarcoma (all 4 cases) and stromal hyperplasia with atypia (also termed STUMP) (7 of 8 cases) had shared chromosomal aberrations by array comparative genomic hybridization (aCGH)
    - It was stated that the commonest was loss of chromosome 13 followed by losses of chromosomes 14 or 10 [16]
    - Additional mutations, such as *CHEK2* and *KTM2D*, had favoured benign entities, whereas *TP53* and *RB1* mutations favoured malignant [16]
        - This suggests 2 separate entities; however, either mutations or rearrangements were found via DNA sequencing in 10 of 10 cases of both STUMP and PSS, while only PSS included phyllodes pattern [4] [21]
- It had been stated that also, the specificity of chromosome 13 and 14 had been questioned and whole exome sequencing found a variety of changes in STUMP and PSS, implying these 2 entities are part of the same spectrum [21]

Differential diagnoses

The differential diagnoses of prostatic stromal sarcoma had been summated to include the ensuing: [4]

- **Stromal hyperplasia with atypia which is also referred to as STUMP**:
    - It has been pointed out that STUMP is more common than stromal sarcoma of the prostate gland.
    - It has been stated that in STUMP microscopy examination of the prostate lesions does demonstrate no evidence of marked atypia or necrosis
    - It has been iterated that microscopy examination of specimens of STUMP lesion demonstrates degenerative nuclei
- **Leiomyoma of prostate the gland:**
    - It has been iterated that leiomyoma of the prostate gland is much more common in comparison with prostatic stromal sarcoma. [4]
    - It has been iterated that leiomyoma of the prostate gland upon immunohistochemistry staining studies is consistently positive **for smooth muscle markers**. [4]
    - It has been iterated that leiomyoma of the prostate gland upon immunohistochemistry staining studies for **CD34** is negative
- **Synovial sarcoma**:
    - It has been stated that synovial sarcoma of the prostate gland is ruled out if **CD34** is positive on immunohistochemistry staining studies of the prostatic lesion. [4]
- **Gastrointestinal stromal tumour of prostate gland:**
    - It has been stated that gastrointestinal stromal tumour of the prostate gland is ruled out if **CD117** is negative. [4]

[B] Miscellaneous Narrations and Discussions from Some Case Reports, Case Series And Studies Related To Prostatic Stromal Sarcoma

Bostwick and Egevad [6] stated the ensuing:

- Prostatic stromal proliferations do account for the majority of benign tumour-like lesions within the prostate gland.
- The most common prostatic stromal proliferation is nodular hyperplasia, which is seen in a majority of elderly men.
- Diagnostic difficulty has tended to be encountered with some variants, including stromal hyperplasia with atypia, characterised by degenerative changes of myofibroblasts.
- On the contrary with benign stromal tumours, malignant stromal tumours of the prostate gland had tended to be uncommon and these account for less than 0.1% of all prostatic malignancies. The most common are rhabdomyosarcoma (paediatric) and leiomyosarcoma (adults); others include phyllodes tumour and stromal sarcoma. Some authors lump malignant tumours with poor outcome (e.g., phyllodes tumour and stromal sarcoma) with benign stromal tumours (e.g., stromal hyperplasia with atypia, leiomyoma), considering them collectively to be of uncertain malignant potential, but this approach is discouraged. [7]

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- Nevertheless, the mean age of the patients in 1 study was 37 years, versus 61 years for stromal tumour of malignant potential (STUMP). [8]

Shen et al. [8] stated the ensuing:

- Prostatic stromal tumour of uncertain malignant potential (STUMP) is an uncommon disease that it might co-exist with prostate stromal sarcoma (PSS).
- They had analysed the histological and clinical features of STUMP.

Shen et al. [8] included twenty-three patients who were diagnosed as being afflicted with STUMP from 2008 to 2019. They collected the clinicopathological and follow-up information of the patients. Shen et al. [8] divided in the subgroup analysis, the patients into a pure STUMP group (N = 18) and a mixed STUMP (STUMP coexisting with PSS) group (N = 5). Student's t test was used to compare the 2 groups. Shen et al. [8] summarised the results as follows:

- The mean age of the patients was 55.5 ± 19.4 years and the average follow-up time of the patients was 42.3 months.
- The mean prostate volume was 109.2 ± 73.5 cm3, and the mean serum prostate-specific antigen level was 8.03 ± 10.5 ng/mL.
- In the sub-group analysis, 16.7% (2/12) of pure STUMP patients had disease progression, while 100% (3/3) of mixed STUMP patients suffered from recurrence. Compared with the pure STUMP group, the mixed STUMP group was younger (37.2 vs. 60.6 years, $p = 0.013$) and had lower expression of oestrogen receptor and progesterone receptor ($p = 0.004$ and $p < 0.001$, respectively).

Shen et al. [8] made the ensuing conclusions:

- STUMP is a rare disease with a relatively good prognosis.
- Nevertheless, there is still a possibility of disease progression or coexistence with stromal sarcoma.
- Timely diagnosis and regular monitoring might be helpful in improving treatment outcomes.

Herawi et al. [9] made the ensuing iterations:

- Specialized stromal tumours of the prostate gland include stromal sarcoma and stromal tumours of uncertain malignant potential (STUMP).
- In view of their relative rarity and lack of long-term follow-up, the prognosis of STUMP had not been clear.

Herawi et al. [9] studied 50 cases of STUMP and stromal sarcoma with regard to their clinical manifestation and follow-up assessments. They summarised the results as follows:

- The ages of the patients had ranged between 27 years 83 years, and their mean was 58 years.
- The major manifesting signs and symptoms were urinary obstructive symptoms (n=25), abnormal digital rectal exam (n=15), haematuria (n=7), hematospermia (n=1), and rectal dysfunction/fullness (n=3).
- A raised serum prostate-specific antigen level was either the sole or a compounding rationale for the initial urological examination and prostate biopsy in a subgroup of patients (n=11).
- The histology examination finding in the 36 cases of STUMP that were not associated with sarcoma were as follows: 25 composed of stroma with scattered cytologically atypical cells associated with benign glands; 8 simulating glandular-stromal

hyperplasia but with hypercellular stroma; 6 with extensive myxoid stroma; and 1 with phyllodes pattern. Four of these cases had mixed patterns.

- Seven cases of STUMP were found to be associated with sarcoma, either concurrently or subsequently.
- In another 7 cases, pure sarcomas were encountered: 3 low grade (LG) and 4 high --grade (HG).
- In 19 STUMPs, the location of the lesion was determinable: 10 cases had arisen within the peripheral zone, 7 cases were located within the transition zone, and 2 cases seemed to have involved both zones.
- In 3 of these cases, tumours were found to be adherent to the rectum at the time of resection.
- There was no evidence of progression of disease for 14 STUMPs pursuant to prostate biopsy, TUR, or enucleation where the follow-up assessment had ranged between 0.3 years and 14 years, with a mean follow-up of 4.9 years.
- Five cases of STUMP had demonstrated local tumour growth: 1 case had increased in size from 6 cm to 7.5 cm in 3 years and 4 cases had recurred frequently necessitating multiple TURs of the prostate (n=2, n=3, n=3, n=3) over 1.1 years, 2 years, 7 years, and 8 years, respectively.
- Fourteen patients who had STUMP had undergone radical prostatectomy (RP) soon after diagnosis; of these, 12 were organ confined where the sized of the tumour had ranged from 0.7 cm to 7.5 cm and the mean size of the tumour was mean 2.7 cm; 2 cases with a history of a 28 grams TUR and a 275 grams enucleation had demonstrated no evidence of residual tumour in their radical prostatectomy (RP) specimen.
- Three cases were lost to follow-up.
- The histological sub-types of stromal tumour of malignant potential "STUMP", did not correlate with the clinical behaviour or likelihood of being associated with sarcoma.
- Two of the low-grade (LG) sarcomas had locally invaded around the seminal vesicle, yet all of the LG sarcomas with follow-up were free of disease at 3 months, 13 months, 24 months, 25 months, 30 months, and 36 months.
- Oot of the 6 high-grade (HG) sarcomas with follow-up, 3 were free of disease at 3 months, 17 months, and 72 months. One man was alive with metastasis to the lung 10 months after RP, 1 man was alive at 280 months with multiple metastases, and another died of disease at 115 months.

Herawi et al. [9] made the ensuing conclusions:

- STUMPs could recur frequently, occur at a young age, often involve the peripheral zone where they could be adherent to the rectum requiring its removal, and could be associated with stromal sarcoma.
- Even though STUMPs could be histologically misdiagnosed as nodular hyperplasia, it is important to recognize that these are neoplasms with unique local morbidity and malignant potential.
- Whereas low-grade (LG) stromal sarcomas could locally invade, high-grade (HG) sarcomas could metastasize and lead to death.

Fabio et al. [10] reported a 79-year-old man, who had manifested with dysuria and increased serum prostate-specific antigen level (21 ng/mL). Hed had MRI scan of the prostate gland which demonstrated bulky prostate enlargement but which was inconclusive in demonstrating neoplastic lesions. However, because of high clinical suspicion for neoplasm, trans-rectal biopsy of the prostate gland was undertaken and pathology examination of the prostate biopsy specimen showed features of stromal tumour of uncertain malignant potential mixed with foci of low-grade primitive prostate stromal sarcoma. 18F-FDG PET/CT scan was undertaken which demonstrated high FDG uptake that was consistent with neoplasm within the lower part of the hypertrophic prostate gland and focal areas of elevated FDG uptake, which was consistent with metastases within his spine, ribs, and femur.

Bostwick et al. [11] stated that phyllodes tumour of the prostate is an uncommon neoplasm of uncertain malignant potential. They studied a large series of phyllodes tumours in order to define the combination of histopathology examination features that are most useful for the prediction of patient outcome. Bostwick et al. [] obtained a total of 23 cases from their collective files from 1973 to 2002, and they evaluated many clinical and pathological features. They undertook a review of the reported cases of phyllodes tumour of the prostate. Bostwick et al. [3] summarised the results as follows:

- The ages of the patients age had ranged between 25 years and 86 years, and their mean age was 55 years as well as they usually manifested with urinary obstructive symptoms and haematuria.
- The diagnosis was established in 18 tumours by transurethral resection, in 2 by enucleation, in 1 by tumour resection and in 2 by prostatectomy.
- They had analysed 5 histological features, including cellularity (scale of 1 to 3), cytologic atypia (scale of 1 to 3), the number of mitotic figures per 10 high power fields, the stroma-to-epithelium ratio (low or high) and necrosis (present or absent).
- This combination of features had shown that 14 cases were low grade phyllodes tumour, 7 were intermediate grade and 2 were high grade with the high-grade cases typified by increased cellularity, severe cytological atypia, more than 5 mitotic figures per 10 high power fields and a high stroma-to-epithelium ratio, indicating stromal overgrowth.
- Immunohistochemistry staining studies of 8 tumours demonstrated consistent, intense cytoplasmic immunoreactivity in stromal cells for vimentin and actin, in luminal epithelial cells for prostate specific antigen, prostatic acid phosphatase and broad-spectrum keratin AE1/AE3, and in basal cells for high molecular weight keratin 34beta-E12.
- Recurrence was seen in 7 of 14 low grade tumours (50%) and in 1 patient low-grade sarcoma had emerged with

subsequent distant metastases 14 years pursuant to the initial diagnosis following 5 recurrences.

- Recurrence was seen in 6 of 7 intermediate grade tumours and low-grade sarcoma emerged with subsequent abdominal wall metastases in 1 patient 11 years after initial diagnosis following 3 recurrences.
- The phyllodes tumour had recurred in each patient with high grade tumours with a time to first recurrence of 6 and 0.2 years, respectively. Distant metastases developed in these 2 patients.

Bostwick et al. [11] made the ensuing conclusions:

- Histological grading of prostatic phyllodes tumours is predictive of short-term outcome based upon the combination of stromal cellularity, cytological atypia, number of mitotic figures and the stroma-to-epithelium ratio.
- Nevertheless, these neoplasms usually recur pursuant to transurethral prostatic resection and they are often locally aggressive with time.
- The emergence of overt sarcoma and metastatic disease is more frequent than was previously recognized.
- Complete resection during the initial diagnosis appears to be indicated.

Wang et al. [12] made the ensuing iterations:

- Phyllodes tumour of the prostate gland is a rare tumour with an unpredictable clinical behaviour.
- It may undergo early recurrence with sarcomatous transformation or might even metastasize.
- Due to the fact that targeted treatments had demonstrated great success against several malignancies, there is hope that these same treatments might demonstrate similar promise in the treatment of other neoplasms.

Wang et al. [12] undertook a study to investigate both amplification of the epidermal growth factor receptor (EGFR) gene by fluorescence in situ hybridization and the overexpression of EGFR, Her-2/neu, CD117 (c-kit), and androgen receptor by immunohistochemical staining in a series of 11 phyllodes tumours of the prostate. Wang et al. [12] reported the results as follows:

- In the stromal elements, EGFR gene amplification was present in four of 11 tumours and polysomy chromosome 7 was present in two of 11 tumours.
- No amplification was present within the epithelial components.
- Only one of 11 tumours had polysomy of chromosome 7 within the epithelial components.
- Immunohistochemically, within the stromal components, EGFR expression was was documented to be demonstrable in four of 11 tumours and androgen receptor was demonstrated in six of 10 tumours.
- Neither Her-2/neu nor c-kit expression was visualised within the stromal components of any of the 11 tumours.
- In the epithelial components, EGFR expression was identified in all 11 tumours with strong staining in the basal cell layers and weak or no staining in luminal epithelium; androgen receptor expression was demonstrated in seven of 10 tumours; Her-2/neu was noted to be weakly positive in four of 11 tumours; and c-kit expression was noted to be present focally and weakly in two of 11 cases with only 2% to 5% of cells staining. The highest staining intensity and the highest percentage of positively staining cells were demonstrated with EGFR immunostaining in both the stromal and epithelial (mainly basal cells) components.
- Androgen receptor staining had demonstrated the next highest staining intensity and percentage of positive cells in both components.
- Her-2/neu and c-kit were only shown to be weakly or infrequently expressed within the epithelial components of prostatic phyllodes tumours.

Wang et al. [12] made the ensuing conclusions:

- Their data had indicated that EGFR and androgen receptor are frequently and strongly expressed in both epithelial and stromal components of prostatic phyllodes tumours.
- EGFR gene amplification is frequently found to be present within prostatic phyllodes tumours and might account for one of the mechanisms leading to protein overexpression in some but not all cases.
- Anti-EGFR and/or antiandrogen agents might be potentially useful for the treatment of patients with tumours that demonstrate positive immunohistochemistry expression for EGFR and/or androgen receptor.

Fabio et al. [13] reported a 79-year-old man, who had manifested with dysuria and increased serum prostate-specific antigen level (21 ng/mL). He had MRI scan of his prostate gland which demonstrated a bulky prostate enlargement but the MRI scan was inconclusive in demonstrating tumour lesions. However, due to his high clinical suspicion for prostatic tumour, trans-rectal ultrasound scan biopsy of the prostate was undertaken and pathology examination of the biopsy specimen revealed features that confirmed the diagnosis of stromal tumour of uncertain malignant potential mixed with foci of low-grade primitive prostate stromal sarcoma. He had 18F-FDG PET/CT scan which demonstrated high FDG uptake that was consistent with neoplasm within the lower part of the hypertrophic prostate gland and focal areas of elevated FDG uptake, that were consistent with metastases within his spine, ribs, and femur.

Mao et al. [14] reported an uncommon case of prostatic stromal sarcoma (PSS), which was treated with a robot-assisted laparoscopic radical prostatectomy (RLRP). Mao et al. [14] reported a 32-year-old man, who had manifested with obstructive voiding symptoms which had persisted over the preceding 2 years. He had a computed tomography scan of his pelvis which demonstrated an 8-cm prostatic mass protruding into the bladder. A trans-perineal ultrasound-guided prostate biopsy was undertaken and pathology examination of the biopsy specimen demonstrated features based upon which a diagnosis of PSS was made. An RLRP was undertaken, and neither chemotherapy nor radiotherapy were administered prior to or pursuant to the

surgery. No recurrence of the tumour was demonstrated at 6 months post-surgery. Mao et al. [14] concluded that:

- To the best of their knowledge, equal to or less than 30 cases of PSS had been reported in the English literature, and their reported case was only the second case to be treated with RLRP.

Pan and Epstein [16] stated the ensuing:

- Specialized stromal tumours of the prostate gland include stromal sarcoma and stromal tumours of uncertain malignant potential (STUMP).
- The molecular signature associated with stromal sarcoma and STUMP had not been un-ravelled.

Pan and Epstein [16] undertook a study to detect the chromosomal imbalances in stromal sarcoma and STUMP by using array comparative genomic hybridization (aCGH). The study had consisted of two cases of stromal nodule, eight cases of STUMP (three degenerative atypia type, three myxoid type, one hypercellular type, and one phyllodes type), and four cases of stromal sarcoma, including a distant metastasis developed metachronously after a primary stromal sarcoma of the prostate. Pan and Epstein [16] extracted DNA from the representative paraffin-embedded formalin-fixed specimens and was submitted for aCGH. All stromal sarcomas and seven STUMPs revealed chromosomal aberrations. Pan and Epstein [16] summarised the results as follows:

- Overall, the most common alteration was loss of chromosome 13 (10 cases), followed by loss of chromosome 14 (9 cases), and loss of chromosome 10 (7 cases).
- Except one stromal sarcoma, which had shown a distinct chromosomal profile of multiple amplifications, other stromal sarcomas had demonstrated a similar pattern to those of STUMP.
- Stromal sarcoma and STUMP shared similar profiles of chromosomal imbalances.

Pan and Epstein [16] concluded that:

From a molecular genetic perspective, the recurrent chromosomal alterations support the concept of specialized stromal tumours of the prostate as a distinctive tumour entity.

Wickramasinghe et al. [17] stated the following:

- Prostatic stromal sarcomas account for about 0.1% of all prostatic malignancies.
- Local recurrence into bladder, seminal vesicles and rectum has been documented.
- Distal metastasis, had up to 2015 only been reported in lung and bone.

Wickramasinghe et al. [17] reported the case of a 42 -year-old man, who had developed a subcutaneous metastatic deposit of a prostatic stromal cell sarcoma 5 years after he had undergone radical prostatectomy. Additional staging with CT- and PET-scan had demonstrated lymph node involvement in his neck and left axilla. A core biopsy of the skin lesion was undertaken, of which the histology had demonstrated a low-grade spindle cell tumour that was morphologically identical to a previously diagnosed prostatic stromal sarcoma. Wickramasinghe et al. [17] made the ensuing educative discussions:

- In literature distant metastases to the lung and bone had been reported before.
- Their reported case was the first documented case of a subcutaneous metastasis of prostatic stromal cell sarcoma.

Wickramasinghe et al. [17] made the ensuing conclusions:

- The preferred treatment for prostatic stromal cell sarcoma is surgery by radical prostatectomy or cystoprostatectomy.
- There was not enough literature on the topic to elucidate the role of chemotherapy or radiotherapy in loco-regional or distant spread.

Choi et al. [18] iterated the following:

- Stromal sarcoma of the prostate is extremely rare and demonstrates rapid growth, which consequently is related to poor prognosis.
- They in the recent past, treated two cases of prostatic stromal sarcoma: one with robot-assisted laparoscopic radical prostatectomy and the other with open radical cysto-prostatectomy with an ileal conduit.
- To the best of their knowledge, their reported case was the first case report of a prostatic stromal sarcoma which managed by the undertaking of a robotic procedure.
- They had reported their experiences in the treatment of prostatic stromal sarcoma by the undertaking of two different methods.

Cavaliere et al. [19] stated the following:

- Prostatic stromal sarcoma (PSS) is an uncommon neoplasm which normally occurs in adult age.
- The management of PSS relies mainly on surgery.

Cavaliere et al. [19] reported the first case of PSS occurring in an adolescent. There was evidence of a good response to chemotherapy including ifosfamide, doxorubicin, vincristine and actinomycin-D, even though the final outcome was dismal. They iterated that their review of the English literature had revealed 14 additional patients with PSS, who were treated with chemotherapy: tumour shrinkage was reported in 4 of the 6 evaluable patients. Cavaliere et al. [19] concluded that:

- Patients with PSS may benefit from the use of chemotherapy in combination with early aggressive local treatment.

Xu et al. [20] made the ensuing iterations:

- Mesenchymal tumours of the prostate are uncommon, rare but include a wide differential diagnosis.

Xu et al. [20] undertook a study, which had aimed to investigate the clinicopathological features which could be utilised to differentiate malignant solitary fibrous tumours (mSFTs) occurring within the prostate gland from prostatic stromal tumours. Xu et al. [20] identified a total of 15 patients who had mesenchymal tumours of the prostate in Nanjing Drum Tower Hospital from 2009 to 2019, including 3 mSFTs, 9 stromal tumours of uncertain malignant potential (STUMPs), and 3 prostatic stromal sarcomas (PSSs). Xu et al. [20] undertook immunohistochemistry staining studies for signal transducer and activator of transcription 6 (STAT6),

aldehyde dehydrogenase 1 (ALDH1), CD34, desmin, smooth muscle actin (SMA), progesterone receptor (PR), CD117, and cytokeratin (CK) on representative sections from each tumour, and they analysed the clinical features, histology, and immunophenotype of these three groups were. Xu et al. [20] summarised the results as follows:

- There was no significant difference in the mean age of the patients who were diagnosed as having mSFTs, STUMPs, and PSSs.
- mSFTs and PSSs demonstrated significantly increased tumour size ($p < 0.05$), Ki-67 proliferation index ($p < 0.0001$), and mitotic activity ($p < 0.05$) when compared with STUMPs.
- mSFTs demonstrated significantly higher expression of STAT6 in comparison with both PSSs and STUMPs ($p < 0.0001$, $p < 0.0001$).
- PR demonstrated significantly more expression in STUMPs than in mSFTs or PSSs ($p < 0.0001$, $p < 0.0001$).
- Desmin and SMA exhibited significantly more expression in STUMPs than in mSFTs ($p < 0.05$). ALDH1, CD117, CK, and CD34 demonstrated no significant difference in staining between mSFTs, STUMPs, and PSSs.

Xu et al. [20] concluded that a limited panel of STAT6, PR, and Ki-67 may be useful in differentiating between mSFTs, STUMPs, and PSSs.

Accosta et al. [21] made the ensuing iterations:

- Tumours of purported specialized prostatic stromal origin comprise prostatic stromal sarcomas (PSS) and stromal tumours of uncertain malignant potential (STUMP).
- Previous studies had described their clinicopathologic characteristics, but the molecular features had remain incompletely understood.
- Furthermore, these tumours are morphologically heterogeneous and the lack of specific adjunctive markers of prostatic stromal lineage make precise definition more difficult, leading some to question whether they represent a specific tumour type.

Accosta et al. [21] undertook a study, in which they utilised next-generation DNA and RNA sequencing to profile 25 primary prostatic mesenchymal neoplasms of possible specialized prostatic stromal origin, including cases originally diagnosed as PSS (11) and STUMP (14). Accosta et al. [21] compared morphologically, the series which comprised 20 cases with solid architecture (11 PSS and 9 STUMP) and 5 cases with phyllodes-like growth pattern (all STUMP). Accosta et al. [21] summarised the results as follows:

- Combined DNA and RNA sequencing results had demonstrated that 19/22 (86%) cases that underwent successful sequencing (either DNA or RNA) harboured pathogenic somatic variants.
- Except for TP53 alterations (6 cases), ATRX mutations (2 cases), and a few copy number variants (-13q, -14q, -16q and +8/8p), the findings were largely non-recurrent.
- Eight gene rearrangements were found, and 4 (NAB2-STAT6, JAZF1-SUZ12, TPM3-NTRK1 and BCOR-MAML3) were useful for reclassification of the cases as specific entities.

Accosta et al. [21] concluded that:

- Their study had shown that mesenchymal neoplasms of the prostate are morphologically and molecularly heterogeneous and include neoplasms that harbour genetic aberrations seen in specific mesenchymal tumours arising in other anatomic sites, including soft tissue and the uterus.
- These data had indicated that tumours of purported specialized prostatic stromal origin might perhaps not represent a single diagnostic entity or specific disease group and that alternative diagnoses should be carefully considered.

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Kim et al. [22] made the ensuing iterations:

- Rhabdoid tumours had been reported in many different anatomical sites of the human body as an aggressive tumour and usually they do manifest with a rhabdoid tumour component, which is a composite tumour rather than a pure rhabdoid tumour.
- Rhabdoid tumour in the prostate had been described only once in the prostatic region as a possible epithelial origin.
- Rhabdoid features in prostatic stromal sarcomas (PSSs) had never been described in the literature.

Kim et al. [22] reported a case of a PSS with rhabdoid features. Kim et al. [22] reported a31-year-old man, who had manifested with a 4-month history of voiding difficulty and anal pain. He had computed tomography (CT) scan of the abdomen which demonstrated an ovoid mass within his prostate gland invading his rectum and urinary bladder. He had a needle biopsy of the prostate gland and pathology examination of the biopsy specimen revealed features which were diagnosed as an unclassified spindle cell sarcoma, and 2 cycles of adriamycin-based neoadjuvant chemotherapy were given, followed by radical prostatectomy. The prostatectomy specimen upon pathology examination revealed a high-grade sarcoma with fascicles of highly cellular spindle cells and numerous mitoses with haemorrhage and necrosis. In areas, the tumour was also found to contain sheets of loosely cohesive epithelioid cells with rhabdoid tumour component. Both spindle and rhabdoid tumour cells upon immunohistochemistry staining studies were positive for vimentin, CD34, and progesterone receptor and negative for desmin and cytokeratin immunostainings. The rhabdoid tumour cells retained INI1 expression. The tumour recurred in the bladder, and the patient died of sepsis. Kim et al. [22] made the ensuing conclusions:

- To the best of their knowledge, their reported case was the first case of PSS with rhabdoid features.
- The tumour showed an aggressive clinical behaviour with a short-term survival of 7 months pursuant to the initial diagnosis.

Ueda et al. [23] stated the ensuing:

- Sarcomas and related proliferative lesions of the specialized stroma of the prostate gland are very rare and had been classified into prostate stromal sarcoma (PSS) and prostatic stromal tumour of uncertain malignant potential based on histology.

Ueda et al. [23] reported a case of PSS. Ueda et al. [23] reported a 40-year-old male, who had manifested with urinary distention. He had Magnetic resonance imaging (MRI) scan, which demonstrated a large prostate mass, and the diagnosis was prostate sarcoma of uncertain differentiation, based

upon pathology examination features of his ultrasound-guided needle biopsy specimens of his prostatic lesion. Total pelvic exenteration was undertaken and a pathological diagnosis of PSS was ultimately reached. Ten months pursuant to his surgery, there had been no signs of metastasis or recurrence.

Morikawa et al. [24] reported a unique case of prostatic stromal sarcoma (PSS), which had recurred within his pelvic cavity with massive high-grade prostatic intraepithelial neoplasia. Morikawa et al. [24] reported a 52-year-old man, who had manifested with urinary retention and who underwent a radical cystoprostatectomy. Pathology examination of the cystoprostatectomy specimen showed that the tumour tissues of the prostate gland had demonstrated an admixture of hyperplastic glands and markedly cellular stroma of spindle cells that were arranged in a fascicular pattern, and the tumour was diagnosed as PSS. 66 months pursuant to his operation, he had CT scans which demonstrated three recurrent tumours around the bilateral obturator and left iliopsoas region. The recurrent tumours were biphasic neoplasms, as before, but the epithelial component had grown prominent and manifested overt atypia in a manner resembling high-grade prostatic intraepithelial neoplasia. Morikawa et al. [24] concluded that their findings had indicated that not only the stromal component but also and the epithelial components of PSS may have malignant potential.

Razi et al. [1] reported a 35-year-old man, who was admitted to their hospital, about 12 years preceding publication of his case report, who had manifested with severe obstructive lower urinary tract symptoms and dysuria. He had been experiencing difficulties in voiding over a period of 4 months preceding his admission. He had digital rectal examination, which demonstrated a large and stony-hard tumour mass over the anterior wall of his rectum. He underwent trans-abdominal ultrasound scan which demonstrated a few heterogeneous echoic areas in a 110-gm prostate and some cystic areas with invasion to his urinary bladder neck. He also had magnetic resonance imaging (MRI) scan of his prostate gland which demonstrated a 25 mm well-circumscribed solid tumour with focal calcification within his prostate gland. (see figure 1).

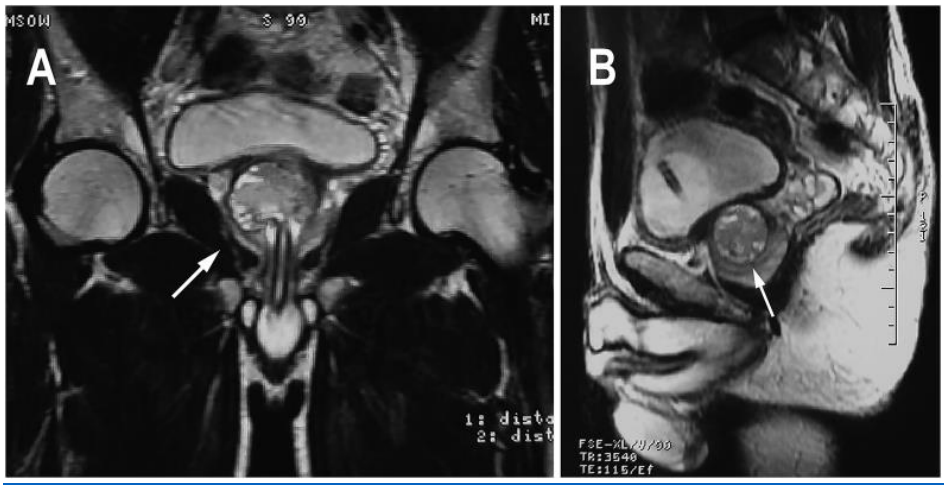

Figure 1: Abdominal-pelvic magnetic resonance imaging revealed a round 2.5-cm diameter mass lesion in the prostate. A: coronal view B: sagittal view. Reproduced from: [1] under the Creative Commons Attribution License.

The result of his serum prostate-specific antigen (PSA) was within the normal range. He underwent trans-urethral prostatectomy (TURP) once, which was not successful; and again, within a month, the second TURP was undertaken. Nevertheless, after two months, the patient was catheterized again. Ultimately, 3 months ensuing his first admission, the prior surgical specimens were reevaluated again within the histopathology department of the authors precisely and based upon the diagnosis of the prostatic stromal tumour, radical retropubic prostatectomy was undertaken consequently. During the surgery, the prostate gland was felt to be an unusually grey-brown polypoidal cystic mass without capsule formation while the neck of his urinary bladder was found to be invaded by the tumour. With regard to pathology examination of the prostatectomy specimen, it was reported that upon transection of the specimen, an irregular polypoid shaped mass, which measured 2 cm in greatest diameter was visualised within the right lateral posterior lobe of the prostate gland, showing cystic areas. In the microscopy histopathology examination of the specimen, a biphasic neoplasm with dominant stromal component exhibiting mild hypercellularity making frequent leaf-like projections were identified. Also, some cystic spaces were visualised in the tumour, all were lined by bland-looking epithelial cells. The stromal spindle cells were noted to be devoid of atypia and had demonstrated less than 1 mitosis/10 HPF. Necrosis was not seen meaning there was no evidence of necrosis within the tumour. The stromal cells had exhibited focally positive immunohistochemistry staining for Desmin. The luminal epithelial and basal cells had exhibited positive immunohistochemistry staining for PSA and 34βE12 in IHC study, respectively. Based upon all the aforementioned findings, the diagnosis of low grade (benign) phyllodes tumour was established (see figure 2).

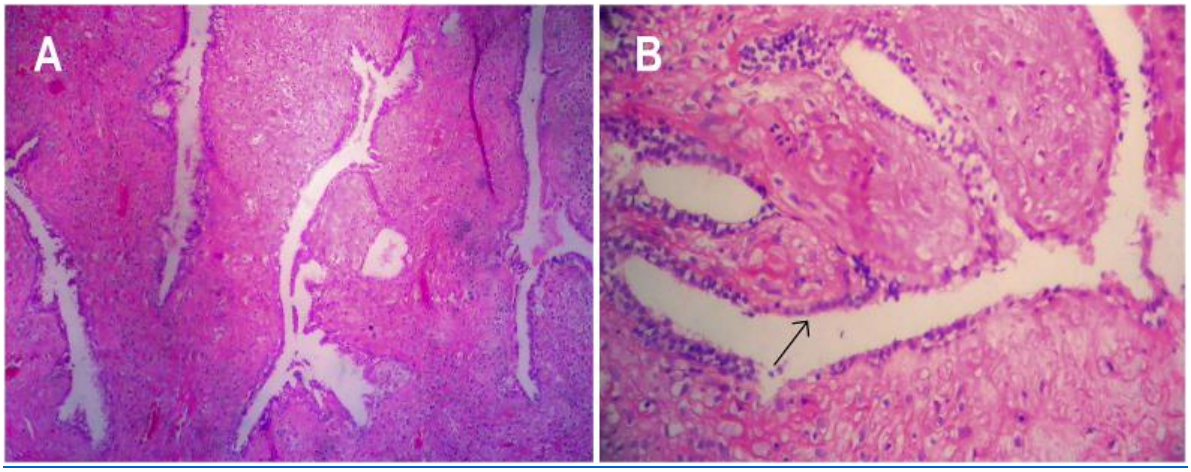

Figure 2. A. Biphasic neoplasm with predominant stromal component making leaf-like projections. B. The clefts are lined by bland-looking epithelial cells (arrow). Reproduced from: [1] Under the Creative Commons Attribution License.

Pursuant to his discharge from the hospital, his periodical close follow-up assessment was planned since Phyllodes tumour of the prostate gland has malignant potential and a high recurrence rate. Nevertheless, in the reported patient, no evidence of recurrence was found during his 12-year follow-up assessments pursuant to his radical prostatectomy. Razi et al. [1] made the ensuing educative discussions:

- Phyllodes tumour of the prostate gland in human beings is an uncommon lesion which had been referred to by various terminologies, including: prostatic cystic epithelial-stromal tumour, the phyllodes type of atypical hyperplasia, cystadenoleiomyofibroma, STUMP (stromal tumour of uncertain malignant potential), PSTUMP (prostatic stromal tumour of uncertain malignant potential) and cysto-sarcoma phyllodes.
- The patients typically tend to manifest with the recurrent urinary obstruction even ensuing the undertaking of resection of the tumour.
- Severe obstructive lower urinary tract symptoms often occurring at a younger age than would be expected for the typical symptomatic benign prostatic hyperplasia, like in their reported case, is the manifesting scenario in some of the patients.
- It has been iterated that histologically, phyllodes tumour of the prostate gland simulates its counterpart in the breast,[3] which is a biphasic stromal and epithelial tumour.
- The stromal component of the tumour can demonstrate variable cellularity with occasional sub-epithelial condensation. [25]
- Even though the classification of the tumour had not been well validated, the amount of cellularity, mitotic figures, necrosis and stromal to epithelial ratio are usual indicators that are utilised to assign the grade of the tumour.
- It has been iterated that the epithelial lining of the tumour is benign and might demonstrate metaplastic or proliferation changes such as squamous metaplasia or basal cell hyperplasia. [25]
- It had been pointed out that important histological diagnostic clues of the tumour include: variable cellular stroma surrounding cysts and compressed elongated channels with frequent leaf-like configuration. [26]
- Benign Phyllodes tumours are regarded to have potent proliferative activity within the prostate gland; nevertheless, but the tumours tend to have no metastatic potential.
- Malignant tumours do exhibit greater cellularity, mitotic figures, necrosis, and stromal overgrowth, and can metastasize to the lung and bones.
- Diagnosis of the tumour in needle biopsy of the prostate lesion pathology examination has tended to be difficult [3] and usually it is based upon pathology examination of specimens of the resected tumour.
- Local recurrence pursuant to the simple resection of Phyllodes tumour had been reported repeatedly even though it was benign pathologically.
- The undertaking of radical prostatectomy is one of the treatment options that would prevent recurrent obstructive symptoms. [27]

Razi et al. [1] summated that their reported case had represented the morphological and immunohistochemical manifestations of Phyllodes tumour of the prostate gland and its long-term follow-up in a young male patient.

Hicks et al. [15] reported a 66-year-old man, who had initially manifested with low-pressure, acute urinary retention. He was catheterized and started on an alpha-blocker (tamsulosin). The initial assessment of his prostate gland by digital rectal examination demonstrated it to be enlarged and benign-feeling. After 2 weeks, he had an unsuccessful trial without catheter and was consented to undergo TURP. During his TURP, it was noted that he had abnormal appearing and chalk-white tissue within the left prostatic lobe on resection; the hardness of the resected tissue was such that it had damaged the resecting bipolar loop twice. Malignancy of the prostate gland was suspected but the histology report returned surprisingly as demonstrating high-grade prostatic stromal sarcoma, in which 80% of the 36 grams of TURP chippings had contained malignant, spindle cell proliferation without

an organized fascicular pattern but with the presence of nuclear atypia, mitotic activity and tumour necrosis (see figures 3, 4, and 5).

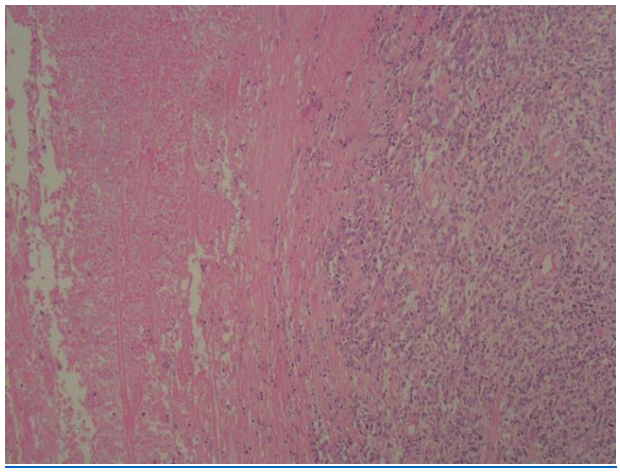

Figure 4: Haematoxylin and Eosin staining with ×10 magnification demonstrating ovoid, short spindle cells without an organized growth pattern. Reproduced from [15] Under the Creative Commons Attribution Licence.

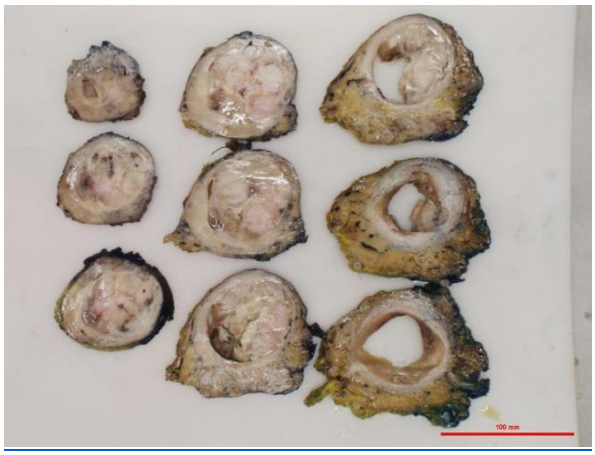

Figure 3: Macroscopic sections of the apical, mid-gland and basal areas of the prostate specimen demonstrating central TURP cavitation and abnormal residual tissue. Reproduced from [15] Under the Creative Commons Attribution Licence.

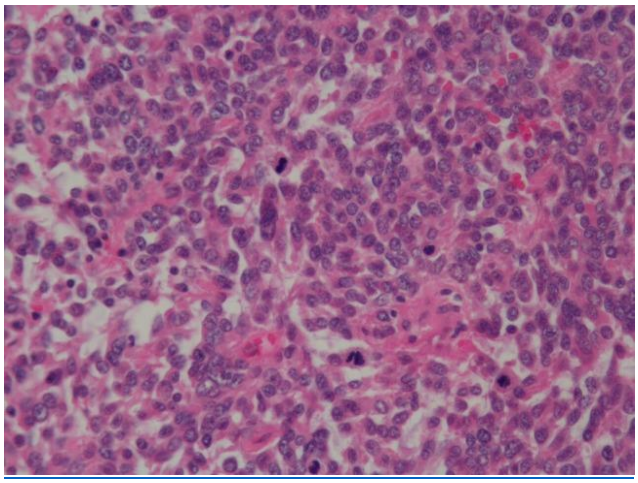

Figure 5: Haematoxylin and Eosin staining with ×40 magnification demonstrating hypercellularity, nuclear hyperchromasia and mitotic activity. Reproduced from [15] Under the Creative Commons Attribution Licence.

He had multiparametric magnetic resonance imaging (MRI) scan of his prostate and pelvis, which demonstrated a heterogeneous enhancement of the remaining prostate tissue. The prostatic capsule was intact; nevertheless, there were enlarged left iliac lymph nodes (see figures 6 and 7). He had staging computed tomography (CT) of thorax, abdomen and pelvis, which did not demonstrate any evidence of progression elsewhere within his body. He therefore underwent an open radical cysto prostatectomy with retroperitoneal lymph node dissection and urinary diversion.

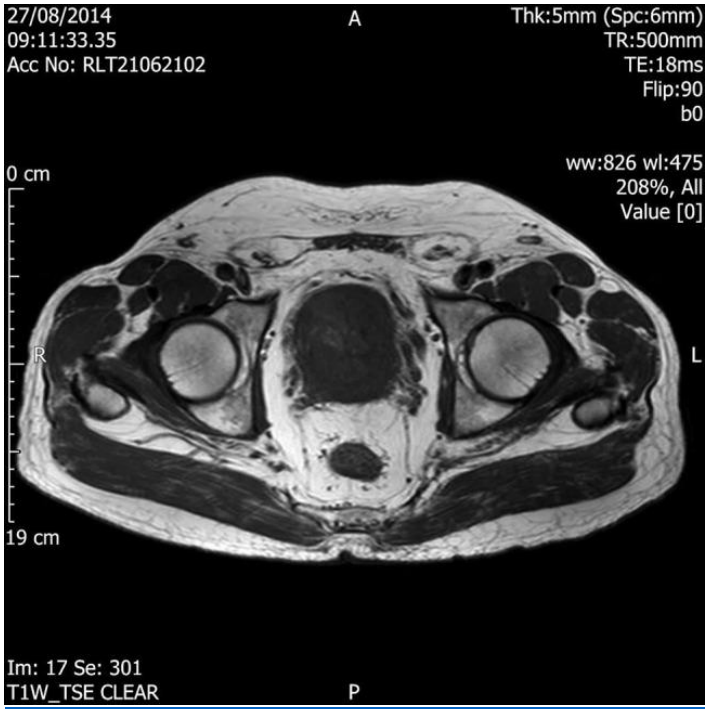

Figure 6: T1-weighted axial MRI image with contrast demonstrating an enlarged prostate with inhomogenous signal. Reproduced from [15] Under the Creative Commons Attribution Licence.

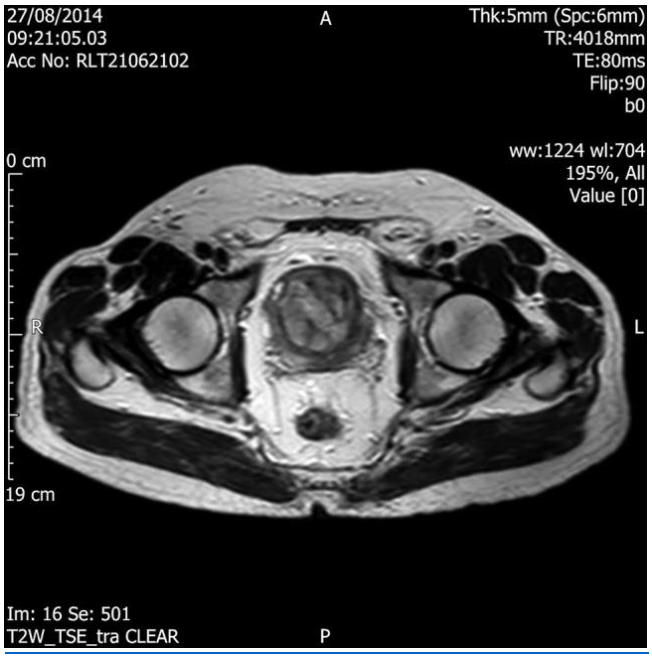

Figure 7: T2-weighted axial MRI image with contrast demonstrating an enlarged prostate with inhomogenous signal. Reproduced from [15] Under the Creative Commons Attribution Licence.

Hicks et al. [15] made the ensuing educative discussions:

- Primary prostate sarcomas are rare.
- The initial manifestation could be with features of bladder outflow obstruction (BOO) such as lower urinary tract

symptoms or acute urinary retention, haematuria or an abnormal finding upon digital rectal examination. [7] [9] [28] [29]

- BOO had been typically reported as being the most common manifestation. [7] [28] [29]
- Serum prostate-specific antigen (PSA) level may be elevated but it has tended to be typically normal [9].
- It has also been reported following pelvic radiotherapy [9].
- Histologically, the stroma within the prostate gland is noted to contain specialized hormonally responsive cells, that participate in complex stromal–epithelial interactions.
- It had been postulated that the exaggeration of these interactions might emanate in the development of primary sarcoma [7].
- Primary prostate sarcoma is histologically typified by stromal hypercellularity, nuclear atypia, mitotic activity and necrosis [30].
- The histological pattern has tended to be diverse with stroma cells varying from round and plump to spindled-shaped [7].
- It could be classified as low- and high-grade.
- High-grade prostatic sarcoma histologically demonstrates proliferation of epithelioid and spindle cells which show an abnormal pleomorphic and hypercellular growth pattern with marked nuclear atypia, mitosis and necrosis.
- Low-grade disease, in comparison, contains no nuclear atypia and lower mitotic rates. [9] [31]
- Sarcomatous sub-types had tended to be mainly leiomyosarcoma and rhabdomyosarcoma. [29] [32]
- Primary prostate sarcoma had also been closely linked to STUMP, which constitutes a stromal proliferation of the prostate with a variety of patterns described [30]. It is closely associated with primary prostate sarcoma because it had been reported both contemporaneously and metachronously [7] [9] [30].
- Radiologically, prostate sarcoma, manifests as a heterogeneous mass with rapid hyper-vascular and heterogeneous enhancement with contrast upon CT scan and MRI scan radiology imaging. Cystic areas may also be found in the tumour [29].
- The management of primary prostatic sarcoma has been iterated to entail a combination of radical surgery, radiotherapy and chemotherapy, in which different combinations have been used [28] [33].
- The undertaking of surgery alone is not deemed as adequate treatment for long-term survival.
- Long-term survival, as well as freedom from local recurrence, had been stated to be associated with clear surgical margins and the absence of metastases at diagnosis [32].
- Age of >50 years, metastases and lack of surgery with curative intent had been stated to be related to poor prognosis [34].
- Aggressive treatment is stated to be required as local recurrence is common, even in low-grade disease. [9] [26].
- Recurrence had been reported as occurring in up to 100% of cases in with high-grade tumours were identified [26].
- High-grade tumours also have been iterated to be associated with a high metastatic potential [31]. They most commonly metastasize to the lungs and bones [26].
- One case series had reported that 62% of patients had distant metastases at diagnosis [32]. Five-year overall survival had ranged from 11.3% to 38% [32] [34].

Hicks et al. [15] made the ensuing conclusions:

- Primary prostatic sarcoma is a potentially aggressive disease even when it is a low-grade tumour.
- The likelihood of local recurrence and metastases warrants that patients with this diagnosis should undergo prompt radical surgery with adjuvant or multimodal treatments subsequent to which close surveillance with long-term follow-up is necessary.

Zamparesee et al. [31] reported a case of a 71-year-old man, who had that developed progressive urinary obstruction symptoms and who was subjected to a transurethral prostatic resection (TURP). Histopathology examination of the prostate chips demonstrated that there was a diffuse proliferation of epithelioid and spindle cells that showed rare atypical mitotic figures. Immunohistochemistry staining studies of the specimen showed that the neoplastic cells had expressed diffusely CD34 and focally progesterone whereas no immunoreactivity was seen for cytocheratin, desmin, S-100, Bcl-2, chromogranin, CD117, and actin smooth muscle. A final diagnosis of low-grade prostatic stromal sarcoma (LG-PS) was made. Zamparesee et al. [31] stated that the lesion was a neoplasm and that in the literature, in fact, to their knowledge, only 6 cases had been reported by the time of the report of their case as well as all of these were alive and free of disease at follow-up. They also reported that their patient too was free of disease at 15 months from the diagnosis.

Batayneh D et al. [35] made a meeting presented with the ensuing abstract summation at the 2024 ASCO Genitourinary Cancers Symposium (Abstract 181):

- Primary sarcoma of prostate gland is exceedingly rare and had not been well-studied.
- They had described the genomic landscape of this rare entity and had identified potential therapy targets.

Batayneh et al. [35] identified from 19,057 cases of prostate cancers, only 11 (<.01%) cases of primary sarcomas and they undertook a comprehensive genomic profiling (CGP) using FDA-approved hybrid capture-based system to assess all classes of genomic alterations (GA). They determined genomic-based ancestry, genomic signature, gLOH, MSI and TMB status by CGP. Batayneh et al. [35] predicted germline status was using a Somatic-Germline-Zygosity algorithm. PD-L1 expression was determined by IHC (Dako 22C3 TPC scoring). Batayneh et al. [35] summarised the results as follows:

- They had reviewed routine histology and IHC stains from all 11 cases centrally.
- There were 9 stromal sarcomas, and 1 each leiomyosarcoma and rhabdomyosarcoma.
- All patients who had a median age of 57 years were clinically advanced stage at the time of CGP.

- The primary tumour site was used in 6 patients and metastatic sites (3 bone, 1 ureter and 1 lung metastasis) in 5 patients.
- The mean number of GA per case was 2.3 (1 to 4 GA/sample).
- The most frequent GA were in *TP53* (36.4%), *RB1* (27.3%), *ATRX* (18.2%).
- Potentially targetable GA were rare and had included MTOR pathway inhibitors for GA in *TSC2* and *PTEN* (1 case each) and PIK3CA inhibitors (GA in *PIK3CA* in 1 case).
- There were 3 cases with non "targetable" gene rearrangements including a *STAT6-NAB2* fusion in a stromal sarcoma (possible solitary fibrous tumour of the prostate gland), a *BCOR-MAML3* fusion and a *TMPRSS2-ERG* fusion in a stromal sarcoma with an adjacent focus of Gleason 6 prostate adenocarcinoma.
- 1 case had featured a predicted germline mutation of the *FLCN* gene.
- All cases were microsatellite stable.
- TMB had ranged from 0 to 9.8 mutations/Mb with median of 3.4 mutations/Mb with no cases at ≥10 mutations/Mb. gLOH scores were low, ranging from 0% to 10.9% (median 2.6%).
- Genomic ancestry was European in 7 patients and Admixed American in 4 others.
- There were no specific genomic signatures identified.
- PD-L1 was tested in 4 cases (all negative).

Batyneh et al. [35] made the ensuing conclusions:

- Prostate sarcoma is an exceedingly rare primary cancer of the prostate gland with limited opportunities for targeted therapy or immunotherapy strategies.
- These tumours do not appear to be driven by "targetable" gene fusions and individual "targetable" mutations are uncommon.

Conclusions

- Prostatic stromal sarcoma is an uncommon malignant tumour of mesenchymal origin which is understood to originate from specialized stromal prostatic cells.
- The specific definition, pathology, and prognosis of prostatic stromal sarcoma had been debated.
- Prostatic stromal sarcoma is stated to have been named at first as atypical stromal hyperplasia, cystosarcoma phyllodes, prostatic cystic epithelial-stromal tumour, and mullerian adenosarcoma-like tumour; most of these cases had been documented as a few isolated case reports and without differentiating them from other spindle cell neoplasms of the prostate gland.
- The phyllodes pattern of mesenchymal proliferation had been included with stromal tumours of uncertain malignant potential (STUMP).
- Gaudin and associates in 1998, were stated to have formally described prostatic stromal sarcoma was formally described by Gaudin et al in 1998.
- The World Health Organization (WHO) which is referred to l'Organisation Mondiale de la Sante [OMS]) classification of prostatic stromal proliferations has included this tumour as a distinctive spindle cell neoplasm and has categorized them as STUMPs and stromal sarcomas
- Considering that only few cases of prostatic stromal sarcomas of the prostate gland afflicting human beings had been reported, it is important for all clinicians in the world who encounter the tumour to report their cases with long-term follow-up assessments to enable clinicians to acquire more updating information about the tumour so as to clearly decide what constitutes prostatic stromal sarcoma, and how the tumour should be treated.

Conflict of Interest – nil

Acknowledgements

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