



Sarcoidosis of the urethra: A Review of the literature

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Abstract

Sarcoidosis of the urethra (SOU) is rare. The aim of the present study was to review the literature on sarcoidosis of the urethra. Sarcoidosis of the urethra can affect both male and female and may present with lower urinary tract symptoms and or ulceration of the urethra. There may or may not be a history of sarcoidosis affecting another part of the body. Diagnosis is confirmed by histological examination of biopsy specimens of the urethral lesion which tends to show non caseating granulomas which may contain inclusion bodies like Schaumaan bodies and Asteroid bodies. Negativity findings on stains for fungal infection and acid fast bacilli are essential to exclude fungal infection and tuberculosis. Treatment options that have been used for SOU include (a) steroid therapy in the form of topical and or systemic steroid therapy, (b) surgical treatment in the form of excision of the lesion, partial urethrectomy or total urethrectomy. Very few cases of SOU have been reported and so far radiotherapy and chemotherapy have not been reported. SOU may respond to steroid therapy but the disease could recur or progress to require surgical treatment. Early diagnosis and careful follow-up of the patient is necessary for the successful treatment of SOU. SOU is a rare disease and a high index of suspicion is required to establish its diagnosis. Early biopsy of the lesion for histological examination for confirmation of non caseating granulomas and exclusion of fungal infection as well as tuberculosis is necessary to provide appropriate treatment of the disease.

Key Words: Sarcoidosis, urethra; non caseating granulomas; Schaumann bodies; Asteroid Bodies; Kveim test; Steroid treatment; partial urethrectomy; total urethrectomy.

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Received: December 20, 2016 Accepted: March 1, 2017. Published: April 20, 2017. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Introduction

Sarcoidosis of the urethra is a very rare disease which could mimic other diseases and which could easily be misdiagnosed.

Aim

To review the literature on sarcoidosis of the urethra

Method

Various internet data bases were searched including: Google, Google Scholar, Educus, and PUB MED. The search words used included sarcoidosis of urethra, urethral sarcoidosis, sarcoid of urethra, sarcoidosis. The review of the literature was based upon twenty five references which were identified as suitable for the topic.

Results Literature Review

(A) Overview

Definition

Sarcoidosis is an idiopathic multisystem disease which is characterized by formation of noncaseating granulomas.

Epidemiology

The prevalence of sarcoidosis has been reported to range between 10 per 100,000 people and 64 per 100,000 people and its peak incidence occurs in the third decade of life. [1] [2] Sarcoidosis has been reported to occur more commonly in African

Americans in comparison with white Americans with a 10-fold higher risk. [1] Bascom and Johns [2] in 1986 reported the commonly affected sites of sarcoidosis as follows: lungs in 53% of cases, mediastinal lymph nodes or hilar lymph nodes in 73% of cases, peripheral lymph nodes in 73% of cases, skin and subcutaneous tissues in 32% of cases, liver in 21% of cases, eye in 21% of cases, spleen in 28% of cases, and bone in 14 of cases. Sarcoidosis of the urethra can occur, in the female as well as in the male urethra but its occurrence is extremely rare. On the whole sarcoidosis involving the genitourinary tract is rare but it has been reported in various organs including the kidney, [3] the female genital tract, [4] [5] testis, [6] ureter, [7] urinary bladder, [8] the penis, [9], and the urethra, [10] In view of the rarity of sarcoidosis of the urethra, the male to female incidence and the incidence of the disease involving the urethra, with regard to race, is unknown.

Aetiology

It has been stated that the cause responsible for the development of SOU is not known for certain but there is the likelihood that environmental factors as well as susceptibility of the individual to develop sarcoidosis do have a role [11]. Some of the statements put forward to support genetic factors and environmental factors postulates related to the development of sarcoidosis have been summarized in the general practice note book as follows: [12]

Genetic factors

- Bourke [11] reported the findings of familial clustering which had indicated an increased incidence of the development of sarcoidosis in monozygous twins in comparison with dizygotic and non-twin siblings.
- Dempsey et al. [13] reported their study conducted on sarcoidosis patients in the United Kingdom in which it was found that 5.9% of the patients with sarcoidosis did have one other relative of the first, second or third degree who also had biopsy proven sarcoidosis.
- Smith et al. [14] iterated that a difference between the populations has been observed in a variety of clinical presentations and also in the absolute prevalence of the disease in that African Americans tend to be more predisposed to the development of prolonged and more severe form of sarcoidosis
- Dempsey et al. [13] reported a major link between sarcoidosis and class II major histocompatibility complex (MHC) region of the 6th chromosome and that erythema nodosum and

Lofgren syndrome was strongly associated with H LA DQB1*0201 in British and Dutch patients.

Environmental factors

- Smith et al. [14] had suggested that person to person transmission or the shared exposure to an environmental agent, are responsible for the geographical clusters that had been reported in epidemiological studies.

It had also been stated that:

- Considering the fact that sarcoidosis tends to commonly involve the lungs, eyes and skin, the development of sarcoidosis would be linked with an air-borne aetiology.
- Previous studies had indicated an association between sarcoidosis and exposure to irritants that are seen in rural settings including emissions that arise from wood-burning stoves and tree pollen
- Positive association does exist between sarcoidosis and exposure to inorganic particles insecticides and mouldy environment.
- Clustering of cases of sarcoidosis had been reported in the winter and early spring.
- Microorganisms including mycobacteria and Propionibacterium acnes and organic/inorganic substances had been suggested to be responsible for the triggering of sarcoidosis. [13] [15]

It has been stated in the General Practice Notebook – a UK medical reference [12] that:

- Defective cell immunity does exist in sarcoidosis which may be illustrated by the exhibition of negative tuberculin test in a patient who had previously had a positive tuberculin test.
- Even though there is reduced response to tests of cellular mediated hypersensitivity, the lungs tend to be a site of intense lymphocytic activity and tend to contain a large number of T lymphocytes and majority of the lymphocytes tend to be T helper lymphocytes. A number of people have interpreted the presence of the pulmonary lymphocytic activity to represent infection; nevertheless, there has never been an isolation of an infective agent in sarcoidosis.
- On the other hand, a different postulate called ‘the nanoparticulate theory’ had been promulgated which has suggested that the pulmonary lymphocyte activity emanates as a reaction against very small foreign particles. [16] The reason why the nanoparticles are not discernible on microscopic examination is that nanoparticles are less than one micrometre in largest dimension and the largest particles tend to be cleared efficiently from the lung by mucociliary transport.

Even though the aforementioned factors have been suggested to elucidate concepts relating to the

development of sarcoidosis, none of the aforementioned postulates has explained why some people develop multi-organ sarcoidosis and why other people develop isolated sarcoidosis like isolated sarcoidosis of urethra or isolated sarcoidosis of penis.

Presentation

Sarcoidosis of the urethra may present with non-specific symptoms including;

- Obstructive and or irritating lower urinary tract symptoms
- Sensation of a lump in the area of the urethra
- Visible haematuria
- A history of systemic sarcoidosis or sarcoidosis involving other organ systems may or may not be obtained.

Clinical examination findings

- With regard to an isolated sarcoidosis of the urethra clinical examination of the patient may reveal: Normal genitalia and external urethral meatus if the lesion is not near the external urethral meatus.
- Induration of the distal urethra mimicking a chronic inflammation or a urethral tumour mass
- If there is an associated systemic sarcoidosis then there could be clinical evidence of the systemic disease which may point to the possibility of sarcoidosis involving the urethra for example cutaneous sarcoidosis lesions in an already diagnosed case of sarcoidosis may help the clinician suspect the possibility of sarcoidosis of the urethra.

Investigations

Haematology investigations

- Full blood count is undertaken as part of the general assessment of the patient and the results may or may not be within the normal range depending upon the general state of the patient and other associated medical conditions of the patient. Even if there is lymphocytosis this would not be diagnostic of sarcoidosis of the urethra.

Biochemistry investigations

- Serum urea and electrolytes, liver function tests, bone profile as well as blood glucose are undertaken as part of the general biochemical tests that are undertaken and the results may be normal. However, in the presence of other associated conditions the results would reflect the associated conditions. In associated hyperparathyroidism, there may be evidence of hypercalcaemia, and raised levels of serum parathormone as well as hypercalciuria in urine biochemistry investigations as observed by Carr et al.[1]

Urinalysis and urine culture

- Urinalysis and urine culture are basic investigations undertaken in the assessment of SOU and these are not specific for the diagnosis of SOU but they are undertaken to determine whether or not there is urinary infection. But if there is any associated urinary tract infection this can be treated as part of the general management of the patient.

Radiological investigations

Chest X-ray scan of renal tract abdomen and pelvis

Chest X-ray tends to be undertaken as part of the general assessment of a patient with sarcoidosis and this may either be normal or may show any co-existing sarcoidosis lesion in the lungs or hilar/mediastinal lesion(s) that may be present but these would not be diagnostic of sarcoidosis. The chest X-ray findings may only show or not show pulmonary/mediastinal/hilar lesions that could be biopsied for histological examination to confirm diagnosis of the lesions.

Ultra-sound scan of renal tract, abdomen and pelvis

Ultra-sound scan of renal tract, abdomen and pelvis would indicate whether or not the patient is emptying his urinary bladder or not and could establish whether or not there is another lesion within the urinary tract as well as in the abdomen and pelvis including lymph node enlargement. Ultrasound scan guided biopsy can also be undertaken of any other lesions that are identified. Ultra-sound scan of the penis could also delineate the extent of the urethral lesion.

Computed tomography scan

Computed tomography (CT) scan of the thorax may show hilar/mediastinal adenopathy or any associated pulmonary lesion that could be biopsied to confirm presence or absence of associated pulmonary or intra-thoracic sarcoidosis. In cases of isolated sarcoidosis of the urethra, the CT scan of the chest may be normal. CT scan of abdomen and pelvis would also confirm presence or absence of any lymph node enlargement or a lesion anywhere else in the abdomen and pelvis.

Magnetic Resonance Imaging Scan

Magnetic Resonance Imaging (MRI) scan of the thorax may show hilar / mediastinal adenopathy or any associated pulmonary lesion that could be biopsied to confirm presence or absence of associated pulmonary or intra-thoracic sarcoidosis. In cases of isolated sarcoidosis of the urethra, the MRI scan of the chest may be normal. MRI scan of abdomen and pelvis would also confirm presence or absence of any lymph node enlargement or a lesion anywhere else in the abdomen and pelvis.

Other investigations that are used to differentiate sarcoidosis from other lesions that mimic sarcoidosis.

In view of the fact that diagnosis of sarcoidosis has tended to be a diagnosis based upon exclusion of other diseases, a number of tests are available that can be used to exclude other diseases or raise suspicion of sarcoidosis. A number of specific stains that are used in staining tissues include:

- Gomori's methenamine silver, Kinyoun's acid-fast stain, and Warthin Starry can be used to stain excised lesions for examination to exclude fungi, acid-fast bacilli, and spirochetes respectively [17] [18]

- Laboratory test results which though not specifically diagnostic of sarcoidosis tend to be suggestive or associated with sarcoidosis. Hypercalciuria tends to be more commonly found in comparison with hypercalcemia. Raised serum levels of Angiotensin Converting Enzyme (ACE) and / or interleukin-2 tend to be found in sarcoidosis but are not diagnostic of the disease. Raised serum ACE levels may also be observed in other diseases including diabetes, cirrhosis of liver, silicosis, or hypersensitivity pneumonitis. [18] [19] Serum parathormone levels tend to be low or low normal in sarcoidosis. [18]

Macroscopic features

The macroscopic features of a sarcoidosis lesion of the urethra are not specific. There may be an ulcer, or swelling, around the external urethral meatus in meatal lesions but these are non-specific. There may also be induration and oedema around the urethra.

Microscopic features

Microscopic examination of sarcoidosis lesions, tend to show the following:

- Non caseating epithelioid granulomas which have tightly packed epithelioid cells, Langhans giant cells, and lymphocytes (T cells)

- There may be evidence of hyalinization, diffuse fibrosis, fibrinoid necrosis, fibrosis within granulomas, intra and extracellular inclusions

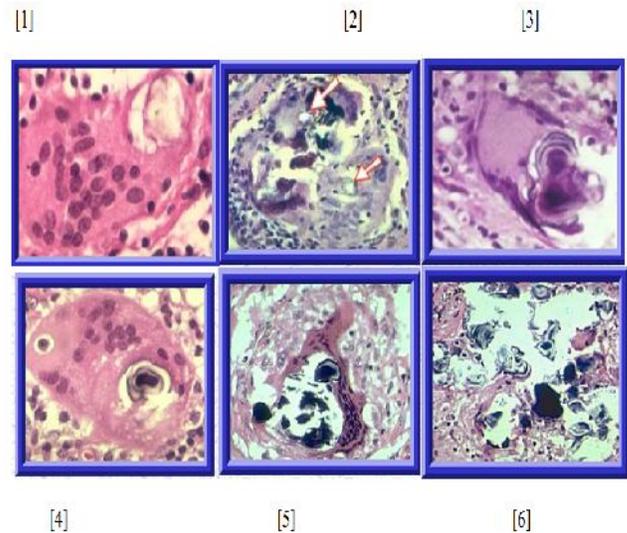
- Schaumann bodies: (laminated concretions of calcium and protein (see figures 1 to 6)- for examples of Schaumann bodies at various stages of formation taken from Rosen Yale) Reproduced from: [20]

- Asteroid bodies: stellate inclusions within giant cells (see figures 7 and 8 for examples of Asteroid bodies at various stages of formation taken from Rosen Yale), Reproduced from: [20]

Differential Diagnosis

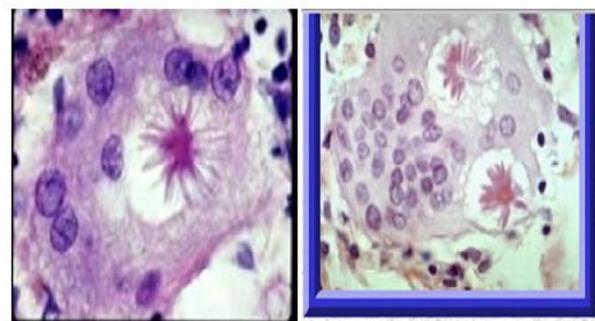
- Sarcoidosis of the urethra may mimic a urethral malignancy.

- Other differential diagnosis of sarcoidosis affecting the genitalia and urethra include: Tuberculosis, Syphilis, Filarial granulomas, Lymphogranuloma venereum, Granuloma inguinale, Blastomycosis, Coccidiomycosis, Actinomycosis, Schistosomiasis, Wegener's granulomatosis. [21]



Figures 1 to 6: [1] Early Schaumann body forming around calcium oxalate crystals [2] Fragmented Schaumann body surrounding calcium oxalate crystals (at arrows) polarized; [3]. Schaumann body [4] Schaumann body [5] Large fragmented Schaumann body [6] Extracellular Schaumann body. Reproduced from: Rosen Y. Inclusions in granulomas Schaumann (conchoidal) bodies Atlas of Granulomatous diseases URL: granuloma.homestead.com/inclusions.html under copy right which states that the images may be copied and utilized for education or other non-commercial purposes.

Figure 7: Asteroid body, sarcoidosis. Figure 8: Asteroid bodies, foreign body granulomas



Figures 7 and 8: Asteroid bodies: Stellate inclusions with numerous rays radiating from a central core. May be seen in granulomas of various entities but are most frequently encountered in the giant cells of foreign body granulomas.

Structures strongly resembling asteroid bodies may be seen rarely in the cytoplasm of tumour giant cells and in fibrin-rich exudates. Reproduced from: Rosen Y. Inclusions in granulomas Schaumann (conchoidal) bodies Atlas of Granulomatous diseases URL: granuloma.homestead.com/inclusions.html under copy right which states that the images may be copied and utilized for education or other non-commercial purposes.

Treatment

General approach to the treatment of sarcoidosis

- It has been stated that with regard to majority of cases of sarcoidosis the management of the disease tends to be dependent upon the severity of the disease. [18]
- It had also been stated that majority of patients affected by sarcoidosis would experience resolution of the disease process within a period of two years. [22]
- With regard to patients whose sarcoidosis remain unresolved, patients who have acute or severe symptoms or patients whose sarcoidosis disease is affecting the function of a major organ system, medical treatment is given. The use of corticosteroid therapy in the management of sarcoidosis with corticosteroids tends to be ensued by improvements in the radiographic features, the symptoms associated with the disease, and metabolic manifestations of the disease. [23]
- With regard to patients with sarcoidosis who have abnormalities of calcium metabolism treatment with Ketoconazole has been stated to have the potential of lowering the levels of vitamin D and calcium. [23]

Specific management of sarcoidosis of the urethra

Only three cases of sarcoidosis of the urethra have been reported therefore there is no consensus opinion relating to its treatment.

Biopsy of the urethral lesion

- Biopsy of the urethral lesion is required for histopathological examination to establish the diagnosis of sarcoidosis as well as to exclude malignancy and other diseases that mimic sarcoidosis.
- Corticosteroid therapy topical / systemic might lead to resolution / regression of the disease; however, the patient would need to be followed-up carefully to assess whether or not there is recurrence of the disease.
- Surgical excision in the form of wide excision of the lesion that is situated at the external urethral meatus may be enough as treatment but in the case of a male urethra associated large sarcoidosis

lesion, amputation of the penis which may be partial or total amputation may be required.

- Radiotherapy has been used to treat a recurrent sarcoidosis lesion on the corpus cavernosum with healing of the lesion, in view of this radiotherapy could be used as initial treatment of a proven case of sarcoidosis of the urethra that is large or which has not responded to corticosteroid therapy to see if this would lead to resolution of the lesion as an attempt to avoid partial amputation or total amputation which could be regarded as mutilating procedures. Considering the fact that there is hardly any information relating to the use of radiotherapy in the primary treatment of sarcoidosis of the urethra, clinicians who adopt this form of treatment would be encouraged to report the cases they treat to enable a consensus opinion to be achieved regarding the usefulness of the treatment strategy.
- Some patients with urethral sarcoidosis who have been treated by means of partial amputation of the penis may subsequently develop stenosis of the urethral meatus of the amputated penile stump that may require meatal dilatation and teaching of the patient to undertake intermittent urethral meatus self-dilatation to prevent/reduce incidences of subsequent stricture/stenosis formation

Steroid Treatment of Urethral sarcoidosis

- Urethrocystoscopy and intra-lesion injection of corticosteroids or systemic oral steroid medication may reduce the size of the lesion or induce remission of the lesion; however, careful follow-up with regular clinical examination and urethroscopy would be required to assess for recurrence or progress of the disease. If there is progress or recurrence of the disease despite steroid treatment then surgical treatment would be required.

Surgical treatment of sarcoidosis of urethra

- Partial urethrectomy or total urethrectomy may be undertaken depending upon the length of the urethral sarcoidosis if it is not responding to steroid treatment.

Radiotherapy

- There is no report of the use of radiotherapy in the treatment of sarcoidosis of the urethra. Even though there is the chance that radiotherapy could be effective in the treatment of some cases of sarcoidosis of the urethra, there is the theoretical likelihood of the subsequent development of multiple urethral strictures which may be difficult to manage.

Chemotherapy

○ There is no report of the use of chemotherapy as treatment option for sarcoidosis of the urethra; perhaps in the future if a chemotherapy option is used in a case of sarcoidosis of the urethra it would be subsequently reported which would indicate whether or not the treatment option is effective.

Miscellaneous treatments

○ If there are any complications associated with isolated sarcoidosis of the urethra these would be treated accordingly.

○ In cases of urethral stenosis urethral dilatation may be undertaken and in cases of retention of urine temporary urethral catheterization prior to steroid and or excision of the urethral lesion may be required.

○ If there is any associated urinary tract infection then an appropriate antibiotic treatment would be given depending upon the antibiotic sensitivity pattern.

○ If there are any sarcoidosis associated lesions are diagnosed they would be managed appropriately by means of steroid therapy and surgical excision as may be required and the lesions would also be assessed regularly.

Outcome

General Outcome of sarcoidosis

Generally the course of sarcoidosis tends to be variable in that (a) acute cases of sarcoidosis, tend to be associated with benign outcome and they tend to occur in young white adults as well as they tend to be characterized by bilateral ankle swellings associated or not associated with erythema nodosum and bilateral hilar lymph node involvement; (b) chronic or recurrent sarcoidosis tends to afflict elderly patients and associated with multi-organ involvement which is more commonly encountered in African Americans and in such situations pulmonary infiltration by sarcoidosis may emanate in the development of pulmonary fibrosis and this type of disease also tends to be resistant to conventional therapy [11]

Outcome of isolated sarcoidosis of the urethra

In view of the very few cases of sarcoidosis of the urethra reported so far in the literature one cannot make any definite comments about the outcome of isolated sarcoidosis of the urethra.

Outcome specific to isolated sarcoidosis of the urethra:

There are only anecdotal reports of 3 cases of sarcoidosis of the urethra reported therefore there

cannot be any generalization about the outcome of isolated sarcoidosis of the urethra.

(B) Miscellaneous narrations from reported cases

Ho and Hayden [10] in 1979 reported a 39-year-old woman who presented with menometrorrhagia and reduced urinary stream on voiding. She had endometrial curettage and during the procedure she was found to have a urethral lesion histological examination of the specimen obtained revealed features which was adjudged to be consistent with sarcoidosis of the urethra. Ho and Hayden [10] stated that their case was the first case of sarcoidosis of the urethra to be reported in the literature.

Carr et al. [1] reported a 60-year-old black woman in 1995 who was seen with a history of progressive obstructive and irritating lower urinary tract symptoms of 2 months duration. In 1990 she had undergone mediastinoscopy and para-tracheal lymph node biopsy and histological examination of the lymph node biopsy was reported to be diagnostic of sarcoidosis and based upon this a diagnosis of systemic sarcoidosis was made. She had a tuberculin skin test and the result was negative. She had Gallium scan at the time of diagnosis which showed activity in the mediastinum only. Pursuant to treatment by means of 60 mg prednisolone medication which was tapered down to 2.5 mg per day she had chest X-ray and computed tomography scan of the chest which did show remission of the disease. She also in 1990 had left renal colic due to left upper renal tract calculus for which she underwent insertion of left ureteric stent and extracorporeal shock wave lithotripsy. She had biochemistry tests which showed hypercalcaemia and hypercalciuria as well as raised serum parathormone level which led to a diagnosis of hyperparathyroidism. Her clinical examination revealed induration of the distal 1.5 cm of the urethra. She underwent urethrocystoscopy which showed an intact urethral mucosa and normal urinary bladder. She underwent incisional biopsy of the indurated pseudo-tumour lesion and histological examination of the specimen revealed features adjudged to be consistent with sarcoidosis of the urethra. She also had urethral dilatation and was treated by means of prednisolone medication with increasing dosages up to 25 mg daily for 2 weeks resulted in relief of her symptoms and clinical improvement of the urethral induration.

Whitakker et al. [24] reported a case of a man who presented with ulceration around his external urethral meatus. Histological examination of the biopsied specimen of the lesion revealed features consistent with sarcoidosis. The lesion initially responded to steroid therapy; however, despite continued steroid therapy the disease had recurred locally and had involved other parts of his penis. He subsequently underwent partial amputation of the penis, and pursuant to the partial amputation of the penis he developed further ulceration at the cut ends of the corpora cavernosa on the penile stump. He was treated by means of radiotherapy to the lesion on the penile stump which resulted in complete healing of the lesion.

Even though only 3 cases of sarcoidosis involving the urethra have been reported in human beings to the knowledge of the author, one case of sarcoidosis has been reported in a horse. Gardiner et al. [25] reported an 18-year-old Arabian stallion that presented with stranguria of recent onset. Examination of the distal part of the stallion's glans showed multiple smooth, glistening, grayish pink, variable-sized, exophytic, nodular masses, that had circumferentially encompassed the external urethral meatus. Partial amputation of the penis was undertaken and histological examination of the specimen showed that the masses had consisted of abundant amounts of loosely arranged fibrovascular stroma which had low numbers of spindle to stellate fibrocytes. The overlying epithelium was found to be mildly to moderately hyperplastic with short anastomosing rete ridges (pseudoeplitheliomatous hyperplasia).

Conclusions

SOU is a rare disease and a high index of suspicion is required to establish its diagnosis. Early biopsy of the lesion for histological examination for confirmation of non caseating granulomas and exclusion of fungal infection as well as tuberculosis is necessary to provide appropriate treatment of the disease.

Conflict of interest: None

Acknowledgement: Dr Y Rosen for allowing reproduction of the figures included in this article for non- commercial purposes.

References

1. Carr L K, Honey J D A, Sugar L. Diagnosis and management of urethral sarcoidosis. *The Journal of Urology* 1995 May; 153: 1612 - 1613

2. Bascom R, Johns C J, The natural History and management of sarcoidosis. *Adv Intern Med.* 1986; 31: 213 – 241
3. Rema J, Carvalho M, Vaz R, Fonseca M, Sampaio S, Praça A, Freitas-Silva M, Cardoso T. Acute renal failure as a form of presentation of sarcoidosis in a young adult. *Journal of Medical Case Reports* 2014; 8: 274 DOI: 10.1186/1752-1947-8-274
4. Salvadjian M. Sarcoidosis of the female genital tract. *Am J Obstet Gynecol.* 1978 Sep 1; 132(1): 78 -80
5. Hassan A, El-Mogy S, Zalata K, Mostafa T. Bilateral epididymal sarcoidosis. *Fertility and Sterility* 2009 May; 91(5): 1957 e1 -3
6. Thuret R, Cariou G. Testicular Sarcoidosis With Elevated Levels of Cancer- Associated Markers *Journal of Clinical Oncology* 2008 Dec 20; 26(36): 6007 – 6008
7. Perimenis P, Athanasopoulos A, Barbalios G. Sarcoidosis of the ureter *Eur. Urol.* 1990; 18: 307
8. Tammela T, Kallioinen M, Konttturi M, Hellstrom P. Sarcoidosis of the bladder: a case report and literature review. *J Urol.* 1989; 141: 608
9. Vitenson J H, Wilson J M. Sarcoid of the glans penis. *J Urol.* 1972; 108: 284
10. Ho K L, Hayden M T Sarcoidosis of urethra simulating carcinoma *Urology* 1979; 13: 197
11. Bourke B Musculoskeletal aspect of sarcoidosis *Topical Reviews* 2009; 2
12. General Practice Notebook – a UK medical reference Sarcoidosis General - Practice Notebook. www.gpnotebook.co.uk/simplepage.cfm?ID=393229
13. Dempsey O J, et al. Sarcoidosis *BMJ* 2009 Aug 28; 339: b3206
14. Smith G M, et al. Advances in the genetics of sarcoidosis. *Clin Genet.* 2008; 73(5): 401 – 412
15. Grutters J C et al. sarcoidosis Chapter 9 *Eur. Resp. Mon* 2009; 46: 126 - 154
16. Heffner D K. The cause of sarcoidosis: The centurial enigma solved. *Ann Diagn. Pathol.* 2007 Apr; 11(2): 142 – 152
17. Vahid B, Weibel S, Nguyen C. Scrotal swelling and Sarcoidosis. *Am J Med* 2006 Nov; 119(11): e3
18. Rao P K, Sebanegh Jr E S Genitourinary Sarcoidosis *Rev Urol.* 2009 Spring; 11(2): 108 – 113
19. Darabi K, Torres G, Chwaproug D. Nephrolithiasis as primary symptom in sarcoidosis. *Scan J Urol. Nephrol* 2005; 39(2): 173 – 175

20. Rosen Y (Yale) inclusions in granulomas Schaumann (conchoidal) bodies Atlas of Granulomatous diseases URL: granuloma.homestead.com/inclusions.html
21. Rudin L, Megalli M, Mesa-Tejada R. Genital sarcoidosis. *Urology* 1974 Jun; 3(6): 750 -754
22. Tjan-Heijnen V C, Viasveld N T, Pernet F P, Pauwels P, De Mulder P H. Coincidence of seminoma and sarcoidosis: a myth or fact? *Ann Oncol* 1998 Mar; 9(3): 321 – 325
23. Matlaga B R, Assimos D G. Urologic manifestations with nonurologic disease urolithiasis. *Urol. Clin North Am.* 2003 Feb; 30(1): 91 – 99
24. Whittaker M, Anderson CK, Clark P B. Sarcoidosis of the penis treated by radiotherapy. *British Journal of Urology* 1975 Jun; 47(3): 325 – 330
25. Gardiner D W, Teifke Jens P, Podell Brendan K, Kamstock Debra A. Fibropapilloma of the glans penis in a horse *Journal of veterinary diagnostic investigations* 2008 Nov; 20(6): 816 - 819