REVIEW

Calcification of the vas deferens and seminal vesicles: a review

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Introduction: Calcification of the vas deferens and seminal vesicles is a rare condition of unknown incidence. It has been described in association with diabetes, hyperparathyroidism and genitourinary tuberculosis, amongst other conditions. Little is known about the clinical significance and management of this condition. We review the literature in an effort to find answers about an entity that is frequently appreciated as an incidental finding.

Materials and methods: An electronic database search was performed (Medline) using the key words: vas deferens; seminal vesicles; calcification, alone or in combination. Articles were selected according to relevance and quality of evidence. **Results:** The search included published manuscripts between 1960 and 2012. A total of 17 relevant publications were identified. The majority were written in the English language and mostly consisted of case presentations and reports of radiologic findings.

Conclusion: Calcification of the vas deferens and seminal vesicles is a rare condition. However, it may be implicated in male factor infertility and symptoms from the urogenital tract. Treatment should be directed towards the underlying cause on an individual basis. It is unknown whether control of the primary process has any effects on the histopathological appearance of the ducts and/or their improvement of function.

Key Words: calcification, vas deferens, seminal vesicles

Epidemiology

Vas deferens and seminal vesicle calcification is a rare condition. Prevalence and incidence have not been established. It is most commonly an incidental finding, usually seen on plain abdominal x-ray requested for other reasons or as a consequence of male infertility investigations, but can also present with hematuria, hemospermia and pain in the perineum and/or chronic

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pelvic pain. The very first case was described by Kretschmer in 1922 and was initially misinterpreted as a bladder stone.¹ Initial reports have associated the condition with diabetes mellitus and chronic genitourinary infections. The first such report was by Marks and Ham in 1942, when they reported 7 out of 9 cases of calcified vas deferens to suffer from diabetes.² Vas deferens calcification was found to be six times more common in this group. In patients with diabetes, the incidence seemed to be increased in younger individuals. In another report, Culver and Tennelhaus insisted that 70% of males with calcified vas deferens since, including diabetes and genitourinary

Etiology	Involvement of the duct	Appearance on imaging (plain x-ray)	Commonly associated conditions
Inflammatory and congenital	Luminal calcification, obstruction	Unilateral, irregular, solid and beaded calcification	Genitourinary (GU) tuberculosis, syphilis, schistosomiasis, chronic GU infection (gonorrhea, chlamydia), congenital renal and Wollfian duct anomalies
Non- Inflammatory	Calcification of the muscular elements in the wall of the duct aperistalsis	Bilateral, regular and symmetrical tubular calcification	Idiopathic, senile (degenerative), Diabetes Mellitus, hyperparathyroidism, uremia Paget's disease of bone, mechanical obstruction of the vas

TABLE 1. Etiology of calcified vas deferens and respective imaging findings according to calcification patterns

tuberculosis, Table 1.³⁻⁷ Involvement is usually bilateral in diabetes, with unilateral involvement described in association with chronic genitourinary infections,^{3,4} and also with unilateral renal agenesis and absence of the contra lateral vas and seminal vesicles.⁵

Pathogenesis and classification

The exact mechanism that results in calcification of the vas deferens is largely unknown, but appears to be related with the underlying disease process. Soft tissue calcification is known to occur with aging and various inflammatory conditions. Ectopic calcifications may be composed of calcium phosphate, calcium oxalate and hydroxyapatite. In the presence of a significant homeostatic disturbance, such as in uremia, diabetes or hyperparathyroidism, widespread calcification of normal tissues is referred to as metastatic. In contrast, dystrophic calcification is usually due to mineral deposition in inflamed, injured or degenerate tissues highlighting tissue alteration and/or necrosis in individuals with normal serum calcium levels. Tuberculosis, syphilis and other chronic infections frequently present with calcified lesions as a consequence of the respective inflammatory reaction. The particular distribution of the calcium deposits in the vas deferens was first described by Culver and Tennelhaus.¹ It was shown that there are two types of presentation, involving either the wall or the lumen of the vas, respectively. In particular, the wall of the duct appeared to be involved more commonly in association with underlying diabetes mellitus or age-related degeneration, while chronic inflammatory conditions (i.e. chronic genitourinary infection) involved the lumen and thus implicated in the development of obstructive azoospermia, Table 1.

Diagnosis

A calcified vas deferens is commonly an incidental finding. History and clinical examination are often unremarkable and non-specific, as patients usually present with lower urinary tract symptoms or signs of urethritis. Commonly associated complaints include hematuria, hemospermia, chronic pelvic pain syndrome and pain on ejaculation.^{8,9} On examination, a beaded, indurated, non-tender vas deferens may be the only



Figure 1. XR KUB showing bilateral calcification of the vasa deferentia (arrows).



Figure 2. Non contrast CT of the abdomen, coronal view. The calcified vasa project on the posterior surface of the prostate (arrowheads).

sign of genital tuberculosis.¹⁰ The calcification is usually an incidental finding on plain x-ray, Figure 1, but may also be detected on abdominal CT, Figure 2,⁶¹¹ during transrectal ultrasound guided prostatic biopsy or as part of investigations for male factor infertility.^{8,9} The



Figure 3. Plain XR of the pelvis showing the degenerative tubular calcification associated with aging (arrowheads).



Figure 4. Non contrast CT of the abdomen, transverse view. The unilateral, irregular calcification of the vas related with inflammatory conditions (arrow), including tuberculosis and schistosomiasis.

pattern of calcification is of differential diagnostic value.

In all non-inflammatory causes of the calcification of the vas (diabetes, age-related degenerative), the lumen of the duct is patent and calcification occurs in the muscular elements. This results in increased tubular opacification of the wall of the vas deferens elements with preservation of luminal patency. In diabetic patients, in particular, it appears as regular, bilateral and symmetrical tubular calcification, which is apparent on plain x-ray, Figure 1.^{1-4,10,12} This is also true for degenerative changes due to aging, Figure 3.^{11,13} On the other hand, in chronic inflammatory conditions (genital tuberculosis, gonorrhea, syphilis, genital schistosomiasis) and in chronic non-specific urinary tract infections, there may be partial or complete occlusion of the lumen of the vas and the calcification is more likely to be unilateral and irregular, Figure 4.^{1-4,10,12,14} For example, tuberculosis tends to cause solid and beaded calcification on plain x-ray.¹¹ Additional imaging is usually necessary to identify the exact origin of the calcification and help exclude the possibility of concomitant congenital anomalies of the urinary tract, Figure 5. This should include high resolution contrastenhanced computed tomography of the abdomen and pelvis and transrectal ultrasonography.8,11,15 MRI with the use of endorectal coil has proved to be invaluable in imaging of the prostate for the suspicion of cancer. However, it has restricted use in diagnosing calcified structures within the ejaculatory system because of low affinity to detect calcium. TRUS is the preferred tool for suspected ejaculatory duct obstruction due to its high diagnostic efficacy.¹⁶ Strictures formation is common with infectious causes and can be identified by vesiculography, Figure 6.^{11,13}



Figure 5. Non contrast CT of the abdomen, coronal view. The calcified vasa may be mistaken for urinary tract stones or calcified lymph nodes (arrows).

Management

Despite the lack of randomized studies, there are numerous case series that provide substantial evidence with regards to management of such patients,^{1-9,11,13} Table2 summarizes landmark studies in the pathophysiology, diagnosis and management of calcified vas deferens. Since only five cases have been described as truly idiopathic to date,^{6,9} it is reasonable to recommend further investigations for associated or underlying



Figure 6. Seminal vesiculography.

pathology. An initial history and clinical overview should take place, with emphasis on sexual history and external genitalia examination. An association with preclinical diabetes mellitus has been suggested from the earliest reports and may be quite significant.^{1-4,13} Therefore, an initial screening for diabetes could be advised in previously undiagnosed patients with bilateral calcification of the vas deferens, bearing in mind that senile degenerative changes are indistinguishable from diabetic calcification. Full blood count and routine biochemistry, ionized calcium and parathyroid (PTH) hormone levels, glycosylated hemoglobin (HgA1c) and fasting blood sugar levels should form part of the initial work up.14 The presence of a chronic, indolent genitourinary tract infection should be suspected and actively sought for in all cases, especially when the finding is accompanied by chronic lower urinary tract symptoms/chronic pelvic pain syndrome. Referral to a specialist genitourinary medicine specialist may

TABLE 2. Summary of the landmark studies in the pathophysiology, diagnosis and management of calcified vas deferens

Authors	Type of publication	Contribution to evidence
Culver and Tannenhaus ¹	Case report and review	Description and pathophysiology
Marks and Ham ²	Case series analysis	Pathophysiology and association with diabetes
Fu et al ⁸	Case report	Imaging in diagnosis (x-ray, ultrasound)
Sengoku et al ⁹	Case report	Clinical diagnosis and imaging (x-ray, ultrasound
Dinulovic et al ¹⁵	Review article	Association with diabetes and infertility
Punit et al ¹⁴	Review article	Management

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be recommended in such cases. Serial morning urine cultures, seminal fluid cultures, tuberculin and VDRL testing may be appropriate when suggested by the history and clinical findings. A baseline contrast enhanced abdominal and pelvic CT should be obtained, and further imaging should be individualized according to findings.¹⁷ A transrectal ultrasound (TRUS) is indicated in cases of concomitant male factor infertility. Treatment should be guided by respective pathology and disease progression. It is unknown whether successful treatment of the principal disease reverses the calcification and/or the effects on the vasa and the seminal vesicles. In the study by Dinulovic et al, electroejaculation has been reported successful when applied to diabetic men with calcified vasa deferentia.¹⁵

Discussion

Calcification of the seminal vesicles and vasa deferentia is rare, hence there is little in the literature concerning morbidity of the condition and effect on quality of life. However, a few associations have been described. Dinulovic and Radonic suggested that diabetic patients with vasal wall calcification may develop failure of emission, where no sperm reaches the posterior urethra due to aperistalsis of the duct.¹⁵ This phenomenon would be in addition to bladder neck dysfunction and retrograde ejaculation due to autonomic neuropathy in this group of patients. A review from another institution has linked the calcified ductus with spermatogenic disturbance in otherwise healthy individuals, with no evidence of obstruction on vesiculography.⁸ Paget's disease of bone has been reported to include metastatic calcified deposits in the vas deferens as part of systemic involvement with unknown consequences.13

Conclusion

Calcification of the vas deferens and seminal vesicles is a rare condition, presenting as part of various diseases, including diabetes, hyperparathyroidism and chronic genitourinary infections, but can also be senile or idiopathic. An incidental finding is the rule; however, it may be implicated in male factor infertility and symptoms from the urogenital tract. Treatment should be directed towards the underlying cause on an individual basis. It is unknown whether control of the primary process has any effects on the histopathological appearance of the ducts and/or their improvement of function. More studies are required in order to clarify the role of this interesting finding as part of the individual disease process.

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