Integrative Review of Case Reports of Corpus Cavernosum Abscess.

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ABSTRACT

Purpose: The aim of this report was to conduct a systematic review of corpus cavernosum abscess case reports documenting the etiological agents and outcomes following treatment.

Materials and Methods: We searched the Medline, Embase, and Cochrane databases for English-language articles published until September 2021 and performed a systematic review according to the 2020 PRISMA protocol. The primary outcome was to determine the erectile dysfunction rate, and the secondary outcome was to report the presence or worsening of penile deviation following corpus cavernosum abscess management.

Results: We found 376 reports and included 41 studies with 42 patients in the systematic review analysis. Thirteen cases (30.9%) reported a first episode or worsening of erectile dysfunction after hospital discharge; five cases (11.9%) developed or had an exacerbated penile deviation during the follow-up.

Keywords: Abscess, Infection, Erectile dysfunction.
I. INTRODUCTION

Penile or corpus cavernosum abscesses are rare infections of the genitourinary system and are secondary to several conditions. The majority of these abscesses, regardless of etiology, are treated with surgical drainage. The outcome of erectile function after surgical drainage ranges from normal to erection with penile deviation to impotence.

The aim of this systematic review was to determine the post-treatment consequences of corpus cavernosum abscesses.

II. MATERIALS AND METHODS

Literature Search

In the present study, a Medline (via PubMed), Embase, and Cochrane database search was carried out until July 2021. The keywords for the search were taken from the Medical Subject Heading terms from the National Library of Medicine, titles, or abstracts through Boolean operators (and/or) including “Abscess” or “Disease, penile.” It should be noted that only studies in the English language were included. Of the total 376 hits, 41 were included based on the inclusion criteria given in PRISMA 2020 workflow.

Inclusion Criteria

The attempt at a systematic review was carried out using the following inclusion criteria: case reports or case series, full texts or abstracts of studies published in English, and online studies published on the Medline (via PubMed), Embase, and/or Cochrane databases up to September 2021.

Exclusion Criteria

The exclusion criteria were non-human studies, review articles, guidelines, systematic reviews or meta-analyses, penile abscess that did not compromise the corpus cavernosum, and incomplete reported data in PRISMA 2020 workflow.

Primary Endpoint

We aimed to determine the erectile dysfunction rate or worsening after corpus cavernosum abscess treatment.

Secondary Endpoint

We also aimed to determine the presence of penile deviation after corpus cavernosum abscess treatment, risk factors, and etiological agents.

Study Selection and Data Extraction

When discrepancy was observed, researchers collaborated in skimming through the paper or conference abstract as a case to be reviewed. For each article, the following features were extracted and recorded through the Number software (Apple Inc., CA, USA): author, publication year, age, causative pathogen, medical history and comorbidities, clinical presentation, pharmacological treatment or aspiration or surgical drainage, and outcome.

The references of the articles were comprehensively surveyed to make sure that there were no additional cases remaining unidentified from the primary search.
Figure 1: Identification of studies via databases and registers. * Exclusion after title reading due to non-genitourinary site. (E.g.: Brain or lung site)** Exclusion after title and abstract reading due to non-genitourinary site (E.g.: Brain or lung site) and prothesis related infection.

**Quality Assessment**

Each article was independently surveyed by at least two authors (AKH and JRPJ), with the standardization of the data to be surveyed. The risk of bias through a specific tool was not performed in this review. The parameters are presented in Table 1.

Abbreviation: ED - Erectile Dysfunction; PD - Penile deviation; CC - continuous; TUR - Trans urethral resection; CT - Computed tomography

**Data synthesis and analysis**

Data were summarized using descriptive statistics, with means and standard deviations for continuous variables and frequencies and percentages for dichotomous variables.

**III. RESULTS**

A total of 376 reports were initially found (Fig. 1). A final total of 41 studies with 42 patients were included in the systematic review analysis. All of the included cases are pooled in Table 1.
The patients had a median age of 46 years (range, 24 days to 78 years). The median major axial size of the abscesses was 3.35 cm (range 2-14). Clinical presentations included fever (47.0%), penile pain (61.9%), swelling (76.1%), urethral pustular discharge (16.6%), and voiding symptoms (16.7%).

Diabetes mellitus seemed to be the most common comorbidity (19.0%). The leading causes were idiopathic (20/42, 47.2%), trauma (5/42, 11.9%), intracavernous injection (5/42, 11.9%), perianal abscess (4/42, 9.5%), periodontal causes (3/42, 7.1%), prior penile surgical procedure (2/42, 4.7%), and other causes (3/42, 7.1%).

Eight cases were treated with primary aspiration (19.0%), six (14.2%) with medicament only, two (4.7%) with broad-spectrum antibiotic and phosphodiesterase 5 inhibitors, 27 cases (64.2%) with surgical incision and drainage, one (2.3%) who underwent endoscopic transurethral resection, and three (7.1%) who underwent total or partial penectomy. One (2.3%) case developed Fournier gangrene and, thus, underwent further penectomy.

Thirteen cases (30.9%) reported a first episode or worsening of erectile dysfunction after hospital discharge and five (11.9%) developed or had a worsened penile deviation during the follow-up period.

<table>
<thead>
<tr>
<th>Author / Year</th>
<th>Age (Years)</th>
<th>Clinical Presentation</th>
<th>Localization</th>
<th>Medical History</th>
<th>Ethiology</th>
<th>Organism(s)</th>
<th>Size (cm)</th>
<th>Intervention</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sater et al. 1989</td>
<td>38</td>
<td>Fever; penile mass</td>
<td>Unilateral</td>
<td>None</td>
<td>Dental Caries</td>
<td>-</td>
<td>3</td>
<td>Surgical drainage</td>
<td>ED + PD</td>
</tr>
<tr>
<td>Niedrach et al. 1989</td>
<td>33</td>
<td>Fever; Penile mass</td>
<td>Unilateral</td>
<td>Depression</td>
<td>Genital trauma + Orchitis + Scrotal abscess leading to orchiectomy</td>
<td>Mixed Bacterial colonies</td>
<td>2x2</td>
<td>Surgical drainage</td>
<td>Resolutio n</td>
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<tr>
<td>Yachia et al. 1990</td>
<td>73</td>
<td>Weak urinary stream</td>
<td>Unilateral</td>
<td>Orchietomy due to “swelling”; Uretral stricture</td>
<td>Idiopathic</td>
<td>tuberculous mycobacterium</td>
<td>-</td>
<td>Oral Trimethoprim- Sulfamethoxazole; Urinary stream resolutio n</td>
<td>Resolutio n</td>
</tr>
<tr>
<td>Moskovitz et al. 1992</td>
<td>43</td>
<td>Fever, Disuria, Penile pain and swelling</td>
<td>Unilateral</td>
<td>DM;</td>
<td>Idiopathic</td>
<td>Streptococcus B-Hemolytic</td>
<td>3</td>
<td>US guided Aspiration (3ml)</td>
<td>Resolutio n</td>
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<tr>
<td>Kropman et al. 1993</td>
<td>56</td>
<td>Penile pain and swelling</td>
<td>Unilateral</td>
<td>Multiple Sclerosis; Neurogenic bladder; Previous ED (papaverine); no DM</td>
<td>Intracavernous therapy</td>
<td>Staphylococcus aureus</td>
<td>2.9x1.5 x1.8</td>
<td>Cefuroxime EV; 19 gauge needle Aspiration</td>
<td>Resolutio n</td>
</tr>
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<td>Symptoms</td>
<td>Side</td>
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<td>Diagnosis</td>
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<tr>
<td>Sagar et al. 2004</td>
<td>19</td>
<td>Penile pain and swelling</td>
<td>Unilateral</td>
<td>None</td>
<td>Idiopathic</td>
<td>S. aureus</td>
<td>Surgical drainage (7ml)</td>
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<td>slight penile deviation, No ED</td>
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<tr>
<td>Sivaprasad et al. 2005</td>
<td>58</td>
<td>Pustular discharge, penile swelling</td>
<td>Bilateral</td>
<td>DM</td>
<td>Perineal abscess</td>
<td>Bilateral cavernotomy and drainage</td>
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<td>Resolutio</td>
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<tr>
<td>Weizberg et al. 2007</td>
<td>42</td>
<td>Scrotal pain and swelling</td>
<td>Unilateral</td>
<td>None</td>
<td>Perianal abscess</td>
<td>Surgical Drainage</td>
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<tr>
<td>Ehara et al. 2007</td>
<td>54</td>
<td>Penile pain</td>
<td>Bilateral</td>
<td>ED</td>
<td>Spontaneous sterile abscess</td>
<td>Surgical drainage; Penectomy</td>
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<td>Thanos 2011</td>
<td>45</td>
<td>Penile pain and swelling</td>
<td>Unilateral</td>
<td>Fever, scrotal unilateral pain</td>
<td>Perineal abscess</td>
<td>CT guided aspiration (120cc)</td>
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<tr>
<td>Song et al. 2012</td>
<td>51</td>
<td>Penile pain and swelling</td>
<td>Unilateral</td>
<td>DM, Hypertension; penile petroleum jelly self-injection</td>
<td>Penile fracture</td>
<td>Surgical Drainage (10ml)</td>
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<tr>
<td>Brennan et al. 2013</td>
<td>56</td>
<td>Penile pain and swelling; pustular uretral discharge</td>
<td>Unilateral</td>
<td>None</td>
<td>Idiopathic</td>
<td>Streptococcus constellatus and intermedium</td>
<td>Surgical Drainage</td>
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<tr>
<td>Dugdale et al. 2013</td>
<td>48</td>
<td>Fever, Penile swelling</td>
<td>Unilateral</td>
<td>Untreated ED</td>
<td>Idiopathic</td>
<td>S. anginosus, yeast, coagulase negative Staphylococcus, mixed anaerobes</td>
<td>Aspiration and Surgical Drainage</td>
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<td>Recurren t abscess; ED, testicular numbnes s</td>
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<tr>
<td>Ranjan 2013</td>
<td>48</td>
<td>Fever, dysuria, perineal pain</td>
<td>Bilateral</td>
<td>DM</td>
<td>Idiopathic</td>
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<td>Bulbar Endoscopic TUR (80ml)</td>
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<td>Uretral Stricture</td>
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<tr>
<td>Kumabe et al. 2013</td>
<td>60</td>
<td>Fever, malaise, pustular uretral discharge</td>
<td>Unilateral</td>
<td>Hartmann’s Surgery with bladder, seminal vesicle total extirpation and prostatic segmentectomy due sigmoid cancer</td>
<td>Blind-ending Urethra</td>
<td>E. coli</td>
<td>Surgical Drainage</td>
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<td>Authors</td>
<td>Case Count</td>
<td>Symptoms</td>
<td>Diagnosis/Procedure</td>
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<td>Paladino et al. 2013</td>
<td>23</td>
<td>Fever, Penile pain and swelling, Painful penile erection</td>
<td>Bilateral Priapism; Sickle cell disease 20 days ago; Surgical Drainage</td>
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<tr>
<td>Dempster et al. 2013</td>
<td>32</td>
<td>Penile and scrotal pain and swelling, fever</td>
<td>Unilateral Mild Asthma Idiopathic Sterile 3,5x2,5 Cavernostomy and debridement ED; penile protheiss</td>
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<tr>
<td>Tuzel et al. 2015</td>
<td>38</td>
<td>Penile pain and swelling</td>
<td>Unilateral Androgen anabolic steroids (nandrolone and stanzolol past 10 years) Idiopathic S. epidermidis 3,2x2,4 Surgical drainage Mild penile deviation</td>
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<tr>
<td>Siraj et al. 2018</td>
<td>49</td>
<td>Penile pain and swelling</td>
<td>Bilateral Balanitis 1 month before Idiopathic S. anginosus 10 x 6 Several Surgical drainages Lost follow up</td>
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<tr>
<td>Bakhsh et al. 2020</td>
<td>36</td>
<td>Penile pain and swelling</td>
<td>bilateral cavernositis Idiopathic Ceftriaxone 1g 8/8h for 2 weeks + Tadalafil 5mg for 3 months Resolution</td>
<td></td>
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<tr>
<td>Bakhsh et al. 2020</td>
<td>26</td>
<td>Penile pain and swelling, urethral discharge, disyria and frequency</td>
<td>cavernositis and Mild ED Idiopathic - Oral Doxicicline + cefuroxime + Intramuscular ceftriaxone 250mg /Tadalafil 5mg + Endovenous Cefuroxime 14 days Resolation</td>
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<tr>
<td>Gore et al. 2020</td>
<td>34</td>
<td>Penile pain and swelling, priapism</td>
<td>bilateral Neurogenic bladder, Selfcatheterization Urethral diverticulum rupture after self catheterization Peptoniphilus asaccharolyticus and Corynebacterium species, 7.8 x 2.9 Surgical Drainage Partial penectomy and perineal urethrostomy</td>
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<tr>
<td>Roberto et al. 2020</td>
<td>43</td>
<td>Fever, Penile pain and swelling</td>
<td>Bilateral none Idiopathic S. anginosus - Surgical drainage No ED after 5 months</td>
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</table>

**IV. DISCUSSION**
Penile abscess with corpus cavernosum involvement is a rare entity whose etiology is still uncertain. Many authors have reported several causal factors, associating it with untreated penile fracture [1-7], the use of intracavernous therapy for erectile dysfunction [8-12], hematogenous spread after periodontal abscess [13-15], perianal [16-18], or intracavitary abscess [19], or after drainage or surgical treatment of priapism [20-21].

In many other cases, the cause remains uncertain [22-41].

The most common initial clinical presentations are onset of penile swelling, pain, and redness. There have been reports of voiding symptoms, perhaps due to urethral deviation by the cavernous abscess [19,23,28,31,33,38,40,42].

Other cases presented with priapism by mimetic effect to ischemic priapism [6,21,26]. Few patients presented with purulent urethral discharge at the initial presentation [5,16,22-24].

The analysis of intraoperative cultures showed that the most commonly found pathogens were those typically found on the skin. In some reports, these pathogens were found in blood cultures, which may suggest septicemia with the primary manifestation being penile abscess of the corpus cavernosum. However, these data may corroborate the theory of agent inoculation from other infectious foci in the corpus cavernosum, which leads to infection and development of the abscess. Poorly conducted penile fractures and procedures for the drainage or surgical treatment of priapism may favor this inoculation and, eventually, abscess formation [21-22]. The hematogenous path also seems to be associated, since there have been reports of an association with dental, perineal, and abdominal infection.

Notoriously, the more aggressive initial treatment with surgical drainage seems to have been the most commonly used in these rare cases [1-3,5,6, 8,10-12, 13, 14, 16, 18-22, 24-26, 28, 35, 37, 42, 43].

However, clinical measures, such as broad-spectrum antibiotic therapy associated with store drainage, have been effective in some cases [9,17,31-33,36].

In other cases, this initial therapy was not effective, and drainage and surgical debridement were necessary in a second stage [8,27,34].

Baksh presented two cases in which the likely association of phosphodiesterase 5 inhibitor (sildenafil) may have increased blood flow to the corpus cavernosum and the efficacy of broad-spectrum antibiotics [23].

Thirteen cases (30.9%) reported a first episode or worsening of erectile dysfunction after hospital discharge and five (11.9%) developed or had a worsened penile deviation during the follow-up period.

Based on this survey, we cannot conclude which cases may respond better to more conservative measures due to an incomplete description of clinical conditions, non-use of validated questionnaires to assess erectile dysfunction, and non-use of standardized measurements of penile deviation and percentage of corpora cavernosa involvement.
The time between the onset of symptoms and the beginning of treatment may be determinant for a smaller area affected by the local inflammatory process, which may contribute to a smaller fibrotic corpus cavernosum scar.

The outcome of penile deviation and erectile dysfunction does not seem to be related to the size of the cavernous abscess since only 10 cases have reported the size as determined via imaging testing.

Further prospective studies evaluating the proportion of compromised tissue, standardized therapeutic measures, and adequate follow-up should be conducted to better elucidate proper care for these patients.

V. LIMITATION

The present study included only PubMed/Medline, EMBASE, and Cochrane database studies available in the English language, which contained an abstract, thereby reducing the number of relevant publications. It was not possible to discuss the bias, risks, or individual limitations of the studies since they were not reported.

VI. CONCLUSION

Corpus cavernosum abscess is rare and its management is still heterogeneous instead of being standardized. The use of broad-spectrum antibiotics and surgical incision and drainage seems to be the choice of most surgeons. Rapid and effective management is critical to reduce the area of post-infectious cavernous tissue fibrosis and morbidity, such as partial penectomy.

VII. REFERENCES