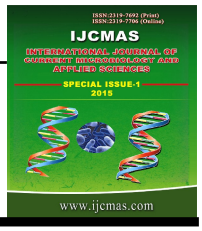
International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-1 (2015) pp. 236-242**
http://www.ijcmas.com



Original Research Article

Semen Culture in Patients with Chronic Prostatitis Syndrome: A Valuable Diagnostic Tool

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Keywords

Semen Culture, Chronic Prostatitis Syndrome, uropathogenic organisms

A B S T R A C T

Chronic Prostatitis Syndrome (CPS) is a common nonetheless neglected clinical entity. Definitive uropathogenic organisms cannot be cultured in many cases. Semen culture is an under-utilized investigation in the management of CPS. This cross-sectional study aims to describe the clinical and bacteriological profile of semen culture of patients with CPS presenting to JNMC Aligarh. We studied 214 patients of CPS from June 2013 to July 2014. The predominant symptoms were pain in pelvic region (58%), increased frequency of micturition (52%), perineal discomfort (32%), painful ejaculation (18%) and erectile dysfunction (15%). Semen cultures were performed in all patients. Of 214 patients examined, 64 had positive semen culture. The most common pathogens were *Escherichia coli* (51.56%), *Enterococcus faecalis* (21.87%), *Staph. aureus* (10.93%), *Pseudomonas aeruginosa* (4.68%), *Klebsiella pneumoniae* (4.68%), *Proteus mirabilis* (3.12%), *Citrobacter koseri* (1.56%) and *Acinetobacter baumannii* (1.56%). *E. coli*, which was the most frequent isolate, was found to be most susceptible to meropenem (90.9%), amikacin (84.84%), nitrofurantoin (81.81%), levofloxacin (78.78%), cefoperazone-sulbactam (75.75%), cefoperazone (72.7%) and ceftriaxone (69.69%). *Enterococcus faecalis*, which was the most commonly isolated Gram positive organism, was found to be susceptible to vancomycin (92.8%), amikacin (71.4%), high content streptomycin (71.4%), amoxicillin (71.4%), levofloxacin (64.2%) and gentamicin (64.2%). Semen culture is an important tool in diagnosis and management of CPS. Proper antibiotic treatment based on it can result in improved quality of life of such patients, decreased burden on health-care sector and decreased chances of antibiotic resistance.

Introduction

Chronic Prostatitis Syndrome (CPS) is a common clinical entity with 50% of men complaining of this condition at some point in their life (Naber and Weidner, 2000). It is the most common urological diagnosis in men who are less than 50 years of age and

the third most common in men greater than 50 years of age (Collins *et al.,* 1998).

It is characterized by pain in the pelvic area, perineum and/or genitalia with variable degree of voiding difficulty and ejaculatory problems (Krieger *et al.,* 1996). The prevalence of prostatitis ranges from 5 to 9 % in the general male population (Lee and Choi, 2012). Universally accepted guidelines for proper diagnostic work-up are lacking and different working groups may use different definitions and hence there may be a significant difference in the number of cases diagnosed as chronic prostatitis (Pavone-Macaluso, 2007).

Men with chronic prostatitis experience health related quality-of-life impairment and the impact on the quality of life is similar to that observed in patients suffering from a recent myocardial infarction, unstable angina or active Crohn disease (Wenninger *et al.,* 1996). The classical four-glass test described by Meares and Stamey in 1968 continues to be the reference standard test for chronic bacterial prostatitis and localizes the source of infection along the lower genito-urinary tract (Meares and Stamey, 1968).

However it is very cumbersome and causes great discomfort to the patients, reducing its utility in clinical practice. 80% of urologists have admitted to rarely using this "gold-standard" test in diagnosing this disease entity in a national survey in the US (Collins *et al.,* 2000). Simpler tests including semen culture and urine culture may be used as an alternative. Various studies have reported the sensitivity of semen culture ranging from 10 to 100% (Mendoza *et al.,* 2004; Lacquaniti *et al.,* 2000; Budia *et al.,* 2006). Semen culture is an under-utilized tool in the diagnosis of chronic prostatitis. We aimed to describe the clinical and bacteriological profile of semen culture of patients with CPS presenting to a tertiary care hospital in Northern India. The data presented in this study will provide useful insights for selection of appropriate antimicrobial agents for the treatment of patients with chronic prostatitis syndrome.

Materials and Methods

Our study was a cross-sectional study conducted involving patients attending Medicine and Nephrology clinics of Jawaharlal Nehru Medical College Hospital (JNMCH), Aligarh, India. We enrolled consecutively 214 patients from June 2013 to July 2014 who had symptoms suggestive of Chronic Prostatitis Syndrome (CPS) on the basis of chronic pain in the last 3 months localized in the genitourinary tract, or pain during or after voiding or ejaculation. Patients gave written informed consent to participate in this study.

Patients with cancer prostate, prostatectomy, in-situ urinary catheters or other urological devices or history of prior antibiotic course in the last one month were excluded from the study. A complete history and physical examination was conducted and the participants completed the National Institutes of Health Chronic Prostatitis Symptom Index (NIH-CPSI) (Litwin *et al.,* 1999; Collins *et al.,* 2001).

The patients were instructed to micturate, wash hands and penis with soap and water, rinse the soap away prior to sample collection. The samples were collected by masturbation in the laboratory in a wide mouth sterile universal container (WHO, 2010).

The samples were examined directly and then cultured. The samples were centrifuged and seeded on blood agar and Teepol lactose

agar, and standard biochemical tests were put up to characterize the bacteria (Practical Medical Microbiology 14th edn, pp 131–49). Kirby Bauer disc diffusion method was used for antimicrobial susceptibility testing as recommended by CLSI M2-A9 (Wayne, 2006). The controls strains used were *E. coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853, and *Staphylococcus aureus* 25922. Statistical analysis was done using the chi-square test and Student's t-test.

Result and Discussion

Out of 214 patients with symptoms of CPS, 64 (29.9%) had significant positive semen culture. Isolates found in semen culture are shown in Table 1.

Escherichia coli alone accounted for around half of the isolates in semen culture (51.56%), followed by *Enterococcus faecalis*, which accounted for one-fifth of the isolates (21.87%). One-tenth of cases were caused by *Staph. aureus* (10.93%). *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* were isolated in equal number of cases, accounting for 4.68% each. 1 out of 64 cases were caused by *Citrobacter koseri* and *Acinetobacter baumanii* each.

The mean age of males presenting with chronic prostatitis syndrome was 52.17 ± 13.51 years with median age of 54 years and range was 17-88 years. Maximum number of patients was in the 51–60 year age group followed by 41–50 year age group as shown in Table 2.

The Gram-negative bacteria were strongly susceptible to meropenem, amikacin, piperacillin-tazobactam, cefoperazone-sulbactam, followed by nitrofurantoin, cefoperazone, ceftriaxone, nitrofurantoin, levofloxacin and gentamicin (Table 3). *E. coli*, which was the most frequent isolate, was found to be most susceptible to meropenem (90.9%), amikacin (84.84%), nitrofurantoin (81.81%), levofloxacin (78.78%), cefoperazone-sulbactum (75.75%), cefoperazone (72.7%) and ceftriaxone (69.69%).

Table 4 depicts the susceptibility of Gram positive organisms. *Enterococcus faecalis*, which was the most commonly isolated Gram positive organism, was found to be susceptible to vancomycin (92.8%), amikacin (71.4%), high content streptomycin (71.4%), amoxicillin (71.4%), levofloxacin (64.2%) and gentamicin (64.2%).

Major presenting symptoms of patients enrolled in our study are illustrated in Table 5. The predominant symptoms were pain in pelvic region (58%), increased frequency of micturition (52%), perineal discomfort (32%), painful ejaculation (18%), erectile dysfunction (15%) and pain during micturition (12%).

Semen culture sensitivity in our study was found to be 29.9%, which has been previously reported by various authors to range between 10 and 100% (Mendoza *et al.*, 2004; Lacquaniti *et al.*, 2000; Budia *et al.*, 2006).

The semen culture sensitivity in our study was lower than the sensitivity described by Montes LRZ *et al.* of 44% and Budia et al of 100% (Budia *et al.*, 2006; Montes *et al.*, 2008). 100% sensitivity rate of semen culture in the study done by Budia et al could be due to the difference in method of collection as it was obtained after the Meares and Stamey test and could have been mixed by expressed prostatic secretions. The mean age of patients in our study was 52.17 ± 13.51 years, which was similar to the findings of Nickel *et al.* who found the mean

age to be 56 years (Nickel *et al.,* 2003). However in a study done by Liang in China, majority of the patients were found to be less than 40 years (Liang *et al.,* 2004). One possible reason could be that study was based on Anonymous questionnaires and younger males are more likely to admit their problems in that format. The most common symptom was pain in pelvic region found in 58% patients which was similar to the findings of Liang *et al.,* who reported pain in the pelvis in 52.3% of patients (Liang *et al.,* 2004).

Members of Enterobacteriaceae were the main isolates found in semen culture in our study. The most common pathogen was Escherichia coli (51.56%), which was similar to the findings reported by other authors (Lipsky *et al.,* 2010; Nickel: Prostatitis and related conditions, 2002). Several factors are responsible for attachment of Enterobacteriacae to the uroepithelium. These gram-negative bacteria use pili, adhesin, fimbriae and P1-blood group phenotype receptor for their attachment (Das *et al.,* 2006).

Amongst the Gram -positive pathogens, *Enterococcus faecalis* (21.87%) were isolated most frequently, which is similar to the findings of other authors who have shown that *Enterococcus faecalis* is one of the most prevalent etiologic pathogens in chronic prostatitis (Weidner *et al.,* 1991; Cai *et al.,* 2011).

Enterococcus feacalis and other predominantly intestinal bacteria isolated from semen samples may reflect changes in sexual preferences. Transmission of normal intestinal flora to the penis is enhanced in patients having anal intercourse. Resistance to fluoroquinolones is increasing possibly due to their indiscriminate use. Resistance of *E. coli* to ofloxacin in this study was significantly high at 75.2%. Resistance of levofloxacin was lesser than ofloxacin, which was similar to the findings of Cai *et al.,* who reported good susceptibility to levofloxacin (Cai *et al.,* 2011). Horcajada *et al.* (2002) demonstrated emergence of quinolone-resistant *Escherichia coli* in faeces of half the patients of prostatitis treated with high-dose oral ciprofloxacin for a month. Resistance of *E. coli* was least (9.1%) for Meropenem and for amikacin (15.1%). Nitrofurantoin has shown a high susceptibility to *E. coli* (81.8%) and can be used as a first line agent as it is cheap, easily available and orally administered.

In our study, *Enterococcus faecalis*, was found to be susceptible to vancomycin (92.8%), amikacin (71.4%), high content streptomycin (71.4%), amoxicillin (71.4%), levofloxacin (64.2%). Zhanel *et al.* have demonstrated nitrofurantoin activity against Vancomycin-Resistant *Enterococci* (Zhanel *et al.,* 2001). Seo and Lee have found *E. faecalis* to be sensitive to nitrofurantoin (100%), vancomycin (100%), imipenem (100%), ampicillin (100%) and levofloxacin (95.2%) (Seo and Lee, 2013). Resistance to third-generation cephalosporins among uropathogens is a cause of concern and may be due to ESBL production and also due to their indiscriminate use.

Proper universal guidelines should be formulated for the correct treatment of patients with chronic prostatitis. Semen culture is an important tool in diagnosis and management of CPS. Semen culture should be considered in all patients and therapy should be guided on the basis of culture results wherever possible. Repeat culture and Meares-Stamey test may be done in negative cases. We recommend nitrofurantoin as a first line agent while awaiting culture results.

Table.1 Distribution of pathogens causing Chronic Prostatitis

Pathogens	**No. of patients**	**%**
Escherichia coli	33	51.56
Enterococcus faecalis	14	21.87
Staph. Aureus	7	10.93
Pseudomonas aeruginosa	3	4.68
Klebsiellapneumoniae	3	4.68
Proteus mirabilis	2	3.12
Citrobacter koseri	1	1.56
Acinetobacter baumanii	1	1.56
Total	**64**	**100**

Table.2 Distribution of patients of CPS according to age

Age of Patients	**No. of patients**	**%**
11-20	6	2.8
21-30	9	4.2
31-40	27	12.6
41-50	57	26.6
51-60	77	35.9
61-70	28	13.1
71-80	8	3.7
81-90	2	0.9
Total	**214**	100

Table.3 Antibiotic sensitivity pattern of the Gram-negative pathogens causing Chronic Prostatitis

Antibiotic Susceptibility	**Pathogens**					
	E. coli	***Pseudomonas aeruginosa***	***Klebsiella pneumoniae***	***Proteus mirabilis***	***Citrobacter Koseri***	***Acinetobacter baumanii***
Levofloxacin	78.8	33.3	66.7	50	0	0
Ofloxacin	24.2	33.3	33.3	0	0	0
Cefixime	27.3	0	33.3	0	0	0
Nitrofurantoin	81.8	66.7	66.7	50	100	0
Amikacin	84.8	66.7	66.7	100	100	100
Gentamicin	66.7	33.3	33.3	0	0	0
Cefotaxime	63.6	0	33.3	0	0	0
Ceftriaxone	69.7	66.7	66.7	50	100	0
Cefoperazone	72.7	66.7	33.3	50	100	0
Cefoperazone–sulbactam	75.7	66.7	66.7	100	100	0
Piperacillin–tazobactam	78.8	100	66.7	100	100	100
Meropenem	90.9	66.7	100	50	100	100

Table.4 Antibiotic sensitivity pattern of the Gram-positive pathogens causing chronic prostatitis

Antibiotic Susceptibility %	**Pathogens**	
	Enterococcus faecalis	***Staph. Aureus***
Levofloxacin	64.2	28.5
Oxacillin	-	57.2
Amoxycillin	71.4	42.8
Cefaclor	-	58.4
Erythromycin	35.7	28.5
Amikacin	71.4	57.1
Gentamicin	64.2	42.9
Clindamycin	57.1	42.9
High content streptomycin	71.4	-
Vancomycin	92.8	100

Table.5 Major symptoms of patients in our study

Symptoms	%
Pain in pelvic region	58
Increased frequency of micturition	52
Perineal discomfort	32
Painful ejaculation	18
Erectile dysfunction	15
Pain during micturition	12

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