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An analysis to compare the clinical reaction, sensitivity and efficacy of Fusidic acid and mupirocin in *S. aureus* isolates in pyodermas: A prospective study in tertiary care teaching hospital

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Abstract

Background: Fusidic acid and mupirocin have been recommended for the treatment of acute staphylococcal skin lesions. Here we will analyze the sensitivity of topical antibiotics like fusidic acid and mupirocin in a series of 205 *S. aureus* isolates from community acquired pyodermas.

Subjects and Methods: Prospective study conducted at the outpatient department of Dermatology, Venereology and Leprosy at Shri Shankaracharya Institute of Medical Sciences Junwani, Bhilai, Distt. Durg, Chhattisgarh, - 490020 between Jan 2019 to Sept 2019. All patients presenting to the outpatient department with primary or secondary pyodermas were eligible for the study. Patients of all age and both sex attending the outpatient department (OPD) of Dermatology with pyoderma after obtaining informed consent to participate in the study. Antibiotic sensitivity for fusidic acid and mupirocin was done for 135 cases and 101 cases respectively. Excluded patients were those who have had a hospital stay in the past one year, those who have already received topical or systemic antibiotics and non-consenting patients. The study was approved by the Institute's Review Board and Ethics Committee.

Results:

Conclusion: Pyodermas, Fusidic acid, mupirocin, *S. aureus*, sensitivity with antibiotics.

Keywords: polythene utilization, adults

Introduction

However, the use of topical antibiotics for the treatment of chronic or recurring dermatitis and surgical or infected wounds may be inappropriate because of possible development of resistance and sensitization. Topical use of bacitracin may produce treatment failure and sensitization. Pyodermas are one of the commonest bacterial pyogenic infections encountered in clinical practice [1]. Primary pyodermas are impetigo, folliculitis, furuncle, carbuncle, ecthyma, erythrasma, and sycosis barbae. Various factors like poverty, malnutrition, overcrowding, and poor hygiene have been stated to be responsible for its higher incidence in the lower socio- economic class. Climatic conditions also play a major role [2]. They constitute a major burden of preventable disease in dermatology outpatients [3]. A significant number of these pyodermas are caused by bacteriae, among which *Staphylococcus aureus* (*S. aureus*) is one of the most commonly implicated organisms in developed countries [5] and in India [4]. *S. aureus* is associated with significant morbidity by causing primary and secondary pyodermas due to which the local epidemiological and microbiological understanding of this species is essential in appropriate health care [5]. It is also known to possess a wide variety of pathogenicity factors.

The overall incidence of streptococcal disease has surged since the mid-1980s [6]. There are reports of invasive infections caused by GAS often associated with shock and multiorgan failure which have increased globally. Localized epidemics continue to appear and, during such outbreaks, the carrier and infection rates in the community increase. After recovery (without antibiotic treatment) from streptococcal pharyngitis, some individuals may carry the

organism for prolonged periods. The carrier state may also occur in the absence of overt antecedent infection. 15-20% of school children carry group A streptococci in the throat. Pyodermas are commonly encountered in children [7]. If diagnosed early and treated appropriately, pyodermas and the skin structure are usually curable.

If diagnosis is delayed

or treatment is inadequate, some infections have the potential for serious sequelae such as nephritis, carditis, arthritis, and septicemia. Therefore selection of the appropriate therapy is the most important step in the management of skin infections, and requires an understanding of the *in vitro* antibacterial activity, pharmacokinetic properties, tolerability of the agent selected, as well as potential resistance of microorganisms. 8 Pyodermas in children vary from generally localized conditions, such as impetigo and folliculitis, to systemic conditions, such as staphylococcal scalded skin syndrome (SSSS). Challenges involved in the use of topical antimicrobials include increasing rates of bacterial resistance, local hypersensitivity reactions (particularly to older agents, such as bacitracin), and concerns about the indiscriminate use of antiseptics potentially coselecting for antibiotic resistance.

We review the evidence for the major clinical uses of topical antibiotics and antiseptics. In addition, we review the mechanisms of action of common topical agents and define the clinical and molecular epidemiology of antimicrobial resistance in these agents. Moreover, we review the potential use of newer and emerging agents, such as retapamulin and ebsele, and discuss the role of antiseptic agents in preventing bacterial skin infections.

Subjects and Methods

All patients with pyoderma who were eligible for the study after meeting the inclusion and exclusion criteria were asked to participate in the study. The methodology was divided into clinical and microbiological methods.

Clinical Method

Theoretically, topical antibiotic use offers several advantages over systemic administration, including delivery of high concentrations of antimicrobial at the required site of action and a reduction in systemic toxicity. In this method, diagnosis is done on prior clinical history of the patients like height, weight, blood pressure, was recorded in standardized proforma.

If patient is qualified for the for the study then only, was sent to the next level else dropped. Data collection was done by principal investigator alone.

The pus collection was done under the supervision of investigation team and done by standard sterile methods with sterile cotton tipped swabs and in two cases the pus aspirate was taken with the help of syringe when a large quantity pus was obtained.

Two swabs were collected from the lesions one for the culture and other for the Gram stain. Then pus swabs and aspirates sent to microbiology department for diagnostic tests.

Microbiological method

However, the widespread use of commonly used topical antibiotics (particularly mupirocin and fusidic acid) has led to increasing bacterial resistance in some settings, limiting

the potential efficacy of such agents. In microbiology lab Swab was smeared on the glass slide and Grams stain was performed. Second swab was cultured on blood agar and Mac Conkey agar as required. The plates were incubated 37°C for 18-24 hours aerobically. After overnight intubation the organisms were identified by their culture characteristics and biochemical reaction according to standard procedures. Antimicrobial susceptibility testing was done for all S aureus isolates by disc diffusion method of Kirby Bauer on Mueller Hilton agar and results were interpreted as per CLSI Guidelines. The antibiotic sensitivity was done for fusidic acid and mupirocin. The results of sensitivity, resistance and intermediate result was determined by the size of zones formed according to the standard of CLSI guidelines. The Zone sizes were looked up on standardized chart accordingly. Cases which have no organisms isolated were excluded from the study.

Results

Table 1: Types of Pyoderma in the study

Types	Cases (n=205)	Percentage (%)
Primary	84	41%
Secondary	121	59%

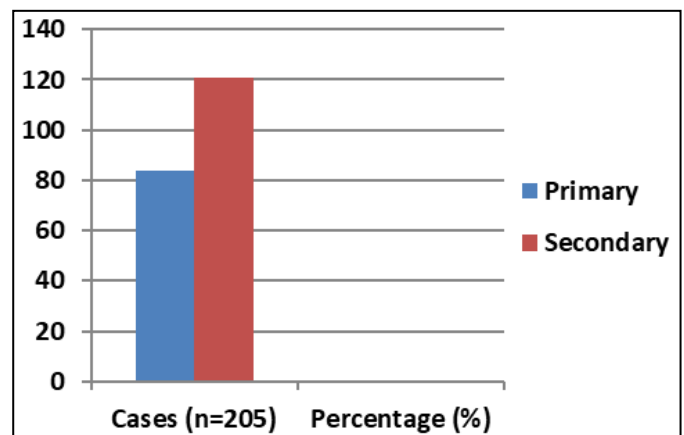


Fig 1: Types of Pyodermas

Table 2: Primary Pyodermas in study

Types	Cases (n=84)	Percentage (%)
Furuncles	39	46.42%
Folliculitis	28	33.33%
Cellulitis	5	5.95%
Ecthyma	4	4.76%
Impetigo	4	4.76%
Erysipelas	2	2.38%
Carbuncle	1	1.2%
Acute Paronychia	1	1.2%

Table 3: Secondary Pyodermas in study

Types	Cases (n=121)	Percentage (%)
Eczema	66	54.54%
Scabies	19	15.70%
Popular urticaria	18	14.87%
Ulcers	7	5.78%
Autoimmune blistering disorders	5	4.13%
Psoriasis	2	1.65%
Dermatophytosis	2	1.65%
Molluscum contagiosum	1	1%
Balanitis	1	1%

Table 4: Various bacteria isolated from the samples included in the study

Bacteria	N=210	Percentage
S. aureus (including 7 MRSAs)	188	89.52%
S. pyogenes	10	4.76%
Pseudomonas aeruginosa	6	2.85%
Klebsiella spp	5	2.38%
Acinetobacter	1	0.5%

Note: The above total of 210 organisms includes additional 5 isolates due to mixed infections. This includes 4 cases of mixed infection with *S. aureus* and *S. pyogenes* and 1 case of *S. aureus* and *Pseudomonas aeruginosa*.

Table 5: Sensitivity for Fusidic acid and Mupirocin for 137 and 102 cases respectively

Fusidic acid (out of 151 cases)	137	14
Mupirocin (out of 102 cases)	102	0

Discussion

Topical antibiotics are among the most commonly prescribed antimicrobial agents. For example, in 2015 there were 4.7 million primary care prescriptions for topical antibiotics in the United Kingdom, at a cost of approximately \$29.9 million. However, although they are widely used, evidence supports the prescription of topical antibiotics for only a small number of indications. Pyodermas constitute a significant burden of cutaneous diseases across the world, and more significantly, in the tropical countries^[9]. They can be classified into primary and secondary pyodermas. In our study out of the 205 cases included 84 were primary pyodermas and 121 were secondary.

Out of the 205 cases, 210 bacteria were isolated. Furuncles were the commonest type of primary pyoderma accounting to about 46.42% of the cases of primary pyodermas which shows almost a near similar prevalence of 39% in the study conducted by Parikh *et al.*^[10] This finding is quite contrasting to study conducted by Gandhi *et al.*,^[11] where in the prevalence of furuncle was just 7% with a higher incidence of impetigo (53%) in their study. Among the secondary pyodermas eczemas were the commonest cause accounting to 54.54% of the cases followed by scabies. This finding is similar to the study conducted by Ahmed K *et al.*^[12] in which eczemas were found to be the commonest cause of secondary pyoderma. Such wide variations can be expected due to sampling errors and the virulence of the organisms.

S. aureus was the commonest isolate accounting to 89.52% of the cases as was described in other studies by Jones *et al.* and Mohanty S *et al.* *S. pyogenes* was prevalent only in 4.5% of the cases^[13, 14].

Conclusion

With the exception of impetigo and nasal decolonization of *S. aureus*, there are limited clinical data to support the widespread use of topical antimicrobials, including in the prevention and treatment of chronic wound infections. Importantly, widespread and indiscriminate use of topical agents, particularly mupirocin and fusidic acid, has led to the emergence of bacterial resistance, predominantly in staphylococci. *Staphylococcus aureus* was the most common organism (89.52%) isolated from primary or secondary pyodermas. This is a global phenomenon and our

study has also depicted the same. Furuncles and folliculitis constituted majority of the primary pyoderma. Eczemas with secondary infection constituted majority of the secondary pyodermas. There were no invasive infections in all cases of MRSA in our study.

Our sampling involved patients from rural areas of Bhilai and Raipur district of Chhattisgarh. Mupirocin was found to have no resistance in any of the cases. However 14 cases showed resistance to fusidic acid.

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