CLINICAL, BACTERIOLOGICAL AND IMMUNOLOGICAL PROFILE OF 20 PATIENTS WITH DERMATITIS CRURIS PUSTULOSA ET ATROPHICANS

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This study was carried out to determine whether an abnormality in polymorphonuclear leucocyte (PMN) function and/or a deficiency in immunoglobulins (IgG and IgM) and complement (C_4 and C_3) could be the underlying cause of chronicity in DCPA. Twenty adult males were studied. Penicillin resistant coagulase positive *S. aureus* was isolated from the pus samples of all the patients. All the strains were susceptible to chloramphenicol, cotrimoxazole and erythromycin. Patch and usage tests done with coconut and mustard oil were negative. The total and differential leucocyte counts in all the patients were within normal limits. In vitro PMN functions were estimated by measuring percentage phagocytosis and intracellular killing capacity (ICK) using *S. aureus* as the test organism. Both these parameters were significantly raised before treatment ($P<0.001$) and returned to normal after treatment. Immunoglobulin levels did not rise above normal which may suggest a depressed response to bacterial infection. Complement (C_3) levels were significantly lower ($P<0.05$) than the controls.

Key words : Dermatitis cruris pustulosa et atrophicans, Immunoglobulins, Complement.

Dermatitis cruris pustulosa et atrophicans (DCPA) is a chronic and recurrent bacterial infection, caused by coagulase positive *S. aureus*. It has been described under various terms such as lupoid sycosis of the legs,[1] Nigerian shin disease,[2] therapy resistant pyogenic folliculitis of leg,[3] and so on.

The cause for its chronicity is not known. We postulated that if there is a deficiency either in the number or in the function of PMN, or a deficiency of immunoglobulins responsible for opsonisation,[4] and/or complement, bacterial infection may persist or recur. A review of pertinent literature revealed that no study has been attempted to define the role of the immune system in the chronicity of DCPA. This study therefore, investigated the immune functions in DCPA.

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Materials and Methods

Twenty adult males who fulfilled the diagnostic criteria of DCPA[5] were included in this study. Informed consent was obtained from all the patients after fully explaining the nature of procedures. The lesions were swabbed with alcohol and pus was collected from an intact follicular pustule. A smear made from the pus was stained with Gram's stain and examined. Pus was also cultured on blood agar and MacConkey's medium and incubated aerobically at 37°C for 24 and 48 hours respectively. Organisms grown were identified on the basis of their morphology, cultural characteristics and biochemical reactions.[6] Antibiotic susceptibility was tested by disc diffusion technique (Bio-disc, Hi-Media).

The polymorphonuclear functions tested included an evaluation of the percentage phagocytosis and intracellular killing (ICK) of *S. aureus*.[7] A 10 ml heparinized venous blood sample was collected at the first visit (during infection) and on follow-up after the treatment

was completed. PMN were obtained by layering the blood after diluting it with saline, on a Ficoll-Hypaque density gradient. Viability of PMN was confirmed by trypan blue exclusion test. The pure culture of PMN was incubated with 0.1 ml *S. aureus*, to give a ratio of 1 : 3 (1 polymorph to 3 *S. aureus*) at 37°C for 1 hour. After washing the PMN, a smear stained by Giemsa's method allowed assessment of percentage phagocytosis : the number of PMN which had ingested *S. aureus*. The phagocytic index was calculated as the average number of *S. aureus* ingested by each PMN. The intracellular killing (ICK) capacity was assessed by lysing PMN with distilled water after incubation with *S. aureus* as described above. Serial dilution of this suspension was performed and the viable count of the last two dilutions carried out after 24 hours incubation. The percentage ICK was then calculated. These were compared with 28 normal volunteers (Control).

Immunoglobulin (Hocchst India Pvt Ltd, Bombay) and complement (C3 and C4) (Immunodiagnostic Pvt Ltd, Delhi) levels were estimated by single radial immunodiffusion using monospecific antisera.[8]

Patch tests for topical antibacterial agents (Desensol, E Merck), patch and usage tests with coconut and mustard oil were performed in all the patients. Readings were taken at 48 hours and at the end of 5 days.[9]

Student 't' test was used for calculating the significance of difference between the patients and the control group.[10]

Results

Out of the 20 adult males, 11 belonged to the age group of 21 to 30 years. The oldest patient was 50-year-old. The duration of the disease ranged from 3 months to 15 years.

The disease process started unilaterally in 5 patients, but only 2 had persistent unilateral involvement. Seven patients had involvement upto the mid-thighs. No patient had lesions on the dorsum of the feet or on any other glabrous area of the skin.

Coagulase positive *S. aureus* was isolated from all the pus samples. All the strains were resistant to penicillin, but were susceptible to chloramphenicol, erythromycin and cotrimoxazole.

Patch tests with topical antibacterial agents were positive in 4 patients. Two patients showed a positive result with nitrofurazone while 2 others were sensitive to both neomycin and framycetin. None of the patients had positive patch or usage tests with oils.

PMN percentage phagocytosis and ICK in the control population were 30.37 ± 5% and 26.41 ± 4.38% respectively. Patients with DCPA showed significantly elevated PMN function with percentage phagocytosis of 45.9 ± 4.75% ($p < 0.001$) and ICK 44.3 ± 7.7% ($p < 0.001$) during the acute phase. In the quiescent phase after treatment, both the functions returned to normal (Table I).

Table I. PMN functions (Mean±SD) before and after the treatment in DCPA patients as compared with normal subjects.

Group	Percent (Mean±SD) values of Phagocytosis	ICK
Control n=28	30.37±5.0	26.41±4.38
DCPA		
Before treatment n=20	45.90±4.75*	44.30—7.7*
After treatment n=20	33.20±7.5	29.80±5.4

* $p < 0.001$

Immunoglobulin levels did not rise above the normal levels in the patients. Complement levels (C3) were significantly low ($p < 0.05$) (Table II).

Table II. Immunoglobulin and complement levels in the patients and controls.

	The levels (Mean±SD) in mg%	
	Patients n=20	Controls n=40
IgG	1667.5±545.6	1640.4±451.9
IgM	159.4±101.5	133.9± 50.8
IgA	204.7± 90.3	213.7± 70.7
C3	67.12± 26.47*	81.5± 20.1
C4	28.98± 23.0	28.8± 10.2

* $p < 0.05$

Comments

An investigation of the PMN function in DCPA patients showed no abnormality. However, lack of immunoglobulin (IgG, IgM and IgA) response and significantly low levels of C3 were observed.

Harman[2] observed a spontaneous resolution of the disease process by the age of 30 years. However, in this study and in that reported by Sugathan et al,[5] DCPA was seen even at the age of 50 years and above. We, like Desai et al[3] did not observe DCPA in any female patient. Sugathan et al[5] reported DCPA in only 7 female cases out of 79 studied. According to Miller,[1] thick mature hair which is more common in males, is a prerequisite for the disease. The maximum duration of the disease ranged from 15 years in the present study to 22 years reported by Sugathan et al.[5]

Like the other workers,[2,3,5] we could isolate only coagulase positive *S. aureus* from the pus samples. All the strains showed resistance to penicillin *in vitro*, while they were susceptible to chloramphenicol, erythromycin and cotrimoxazole.

All the patients except three, showed a good response to cotrimoxazole (sulfamethoxazole 80 mg and trimethoprim 160 mg) 2 tablets twice a day orally for 6 weeks. Three patients improved with erythromycin (250 mg QID) for 4 weeks. Jaeyk[11] observed a complete resolution of DCPA in 19 out of 24 patients, who were treated with septrim for 3 to 4 weeks. One of his cases did not respond while three others showed minimal improvement. Miller[1] reported a case who showed temporary and moderate improvement with 40 mg of prednisolone. Srinivas and Shenoy[12] reported good response in DCPA with a combination of PUVASOL and cotrimoxazole.

According to Harman[2] circumstantial evidence suggested that vegetable oils, mainly coconut oil was a causative agent, while Sugathan et al[5] believed that oil did not influence the course of the disease in any way. All the patients in this study gave a history of massage with coconut/mustard oil. Although the oil was applied all over the body, lesions were predominantly localised to the legs. Seven patients had minimal involvement of the thighs. Patch and usage tests with coconut and mustard oil were negative. Oil is an unlikely cause of DCPA.

As DCPA is chronic, most of the patients had applied topical antibacterial agents for a long period of time. Patch tests with topical antibacterial agents were positive in only four cases. Allergic contact dermatitis due to topical antibacterial agents may act as a perpetuating factor.

Total and differential WBC counts were within normal limits. Both the parameters of PMN functions i.e. percentage of phagocytosis and percentage ICK were significantly raised above normal ($p < 0.001$) in the initial stage and returned to normal after treatment, suggesting that there is no abnormality of PMN function.

In any bacterial infection, there is an initial rise of immunoglobulin IgM followed by IgG, which act as opsonins.[4] We did not observe a significant rise in immunoglobulins which may suggest a depressed immunological response.

Complement C3 levels were significantly low ($p < 0.05$). Morginson et al[13] observed low gammaglobulin levels in 82% and a deficiency of complement depending factor in 44.3% of their cases of chronic persistent folliculitis and furunculosis. In contrast to our findings, Tiwari et al[14] observed raised IgG in all 15 cases studied by them, along with a marginal increase in IgA in 3 patients.

Our observations suggest that a depressed immunoglobulin response with low levels of C3 may play a decisive role in the chronicity of DCPA.

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