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Pre-Operative Skin Preparation with Chlorhexidine-Alcohol Vs Povidine-Iodine- A Comparative Study

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Abstract: *It is an established fact now that the normal skin of healthy human beings harbours a rich bacterial flora. Normally considered non-pathogenic, these organisms may be a potential source of infection of the surgical wound.*
Approximately 20% of the resident flora is beyond the reach of surgical scrubs and antiseptics. The goal of surgical preparation of the skin with antiseptics is to remove transient and pathogenic microorganisms on the skin surface and to reduce the resident flora to a low level. Povidone iodine (Iodophors) and chlorhexidine are most often used antiseptics for pre-operative skin preparation.
Keywords: *Povidine-Iodine, Chlorhexidine-Alcohol, skin-preperation, infection.*

I. Introduction

Despite many advances in the surgical techniques in the past few years, post–operative wound sepsis still remains a major problem. Although only occasionally a cause of mortality, it is a frequent cause of increased morbidity leading to prolonged hospitalization of the patient. Wound infections occur in approximately 5% of patients undergoing major abdominal surgery.[1]Inspite of the fact that different studies have been carried out by various workers pointing towards one or another as source of sepsis, yet it is still controversial to indict one and exonerate the other.[.2,3,4,5]

A confusion still prevails regarding the source of wounds sepsis. Hence there is a further need for systematic probe into the minute details of etiology of wound infection.

Several factors contribute to the development of post-operative wound infections, some relating to the patient and some relating to the procedure itself.[6]

II. Case Study

This is a comparative study in which 60 patients were studied in two groups.(30 patients in each group) In each case preoperatively, detailed history was taken and routine investigation like haemoglobin, total count, differential count, ESR, RBS and chest X-ray were done to rule out any acute or chronic infection or malignancy. Preoperative shaving of the parts was done at the same time on previous evening for all the patients. The preoperative skin preparation in each group is done with the respective antiseptic regimen.

Group I: Antiseptic regimen used for preoperative skin preparation is single coat of aqueous povidone iodine IP 5% w/v.(fig-1)

Group II: Antiseptic regimen used is single coat of agent containing chlorhexidine gluconate 2.5% v/v in 70% propanol.(fig-2)

Fig-1

Fig-2

Distribution of patients based on Surgical diagnosis.

In the present study it was observed that group A comprised of patients who underwent surgeries for lipomas (20%), Fibroadenomas (16.7%), Hernias(Inguinal,ventral and epigastric hernias) (56.7%), thyroid (6.7%) compared to group B that comprised of patients who underwent surgeries for lipomas (16.7%), Fibroadenomas (20%), Hernia(Inguinal,ventral and epigastric hernias) (46.7%), thyroid (16.7%). However there was no significance in both groups p>0.05.

Table 1: Distribution of Patients based on surgical diagnosis**.**

Diagnosis	Group A		Group B	
	No. Of patients	%	No. Of patients	%
Lipomas	6	20	5	16.7
Fibroadenomas	5	16.7	6	20
Hernias(Inguinal, ventral and epigastric)	17	56.6	14	46.6
Thyroid surgeries	2	6.7	5	16.7
Total	30	100	30	100
Chi square value=1.758			p value= 0.642	

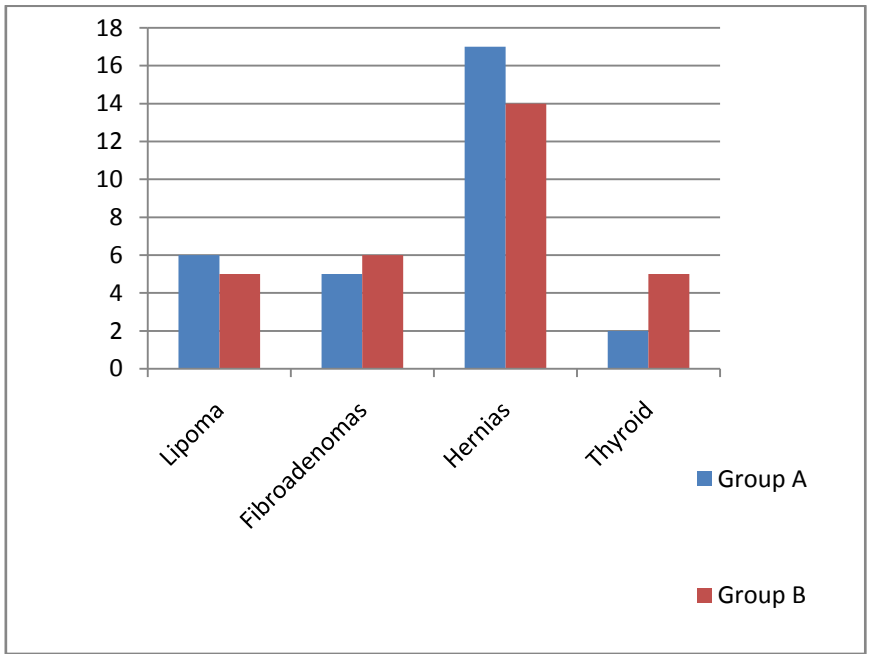

Fig-3 Surgeries performed in patients

The diagnosis and nature of operations were variable and thus the sites of incisions also varied and incisions were found all over the body. However all the surgeries were clean and elective.

Table 2: Type Of Operation

Type of surgery	Group A		Group B	
	No. Of patients	%	No. Of patients	%
Anatomical repair of epigastric hernia	1	3.33	0	0
Excision of fibroadenomas & lipomas	11	36.67	11	36.67
Rt. Hemi-thyroidectomy	1	3.33	4	13.33
Herniorrhaphy	1	3.33	0	0
Lichenstein mesh repair	10	33.33	8	26.67
Mesh repair for ventral and epigastric hernias	5	16.67	6	20
Sub-total thyroidectomy	1	3.33	0	0
Lt. Hemi-thyroidectomy	0	0	1	3.33

Table 3: Site of Incision

Site of incision	Group A		Group B	
	No. Of patients	%	No. Of patients	%
Ant. Abdominal wall	5	16.67	6	20
Circum areolar region	5	16.67	6	20
Epigastric region	2	6.67	0	0
Front of neck	2	6.67	5	16.67
Left leg	1	3.33	0	0
Lower ant abdominal wall	11	36.66	8	26.67
Right arm	1	3.33	1	3.33
Right thigh	2	6.67	1	3.33
Upper arm	1	3.33	0	0
Forearm	0	0	1	3.33
Left arm	0	0	1	3.33
Right leg	0	0	1	3.33

In both the groups initial skin swab for culture and sensitivity was taken at the planned site of incision before application of antiseptics. Second skin swab for culture and sensitivity was taken after application of antiseptic solution. Third skin swab for cultureand sensitivity was taken post operatively from after the closure of incision site in clean elective surgery. Fourth swab was taken on the day 3 of post-operative period. Swab was transferredto microbiology department to determine whether any microorganisms were left behind and hence to compare the efficacy of Both the regimes of skin preparation.

Group A showed, Staph aureus in 3.33%, Diphtheroids in 3.33%, bacillus in 3.33%, streptococci 3.33%, No bacterial growth was seen in 86.67%.

Group B showed Coagulase negative staph in 3.33%, bacillus in 3.33%, No bacterial growth was seen in 93.33%. how ever there was no statistical difference in the pattern of culture growth seen postoperatively after closure of incision site.

Table 4: Comparision of microbiological swab data collected before application of antiseptics.

Swab 1 culture growth	Group A		Group B	
	No. Of patients	%	No. Of patients	%
Coagulase negative staph	14	46.67	15	50
Polymorphs	8	26.67	7	23.33
Enterococci	3	10	2	6.67
Staphaureus	2	6.67	0	0
Diphtherioids	2	6.67	2	6.67
Ecoli	0	0	3	10
streptococci	0	0	1	3.33
No bacterial growth	1	3.33	0	0
Total	30	100	30	100
Chi square value = 7.3			p value = 0.39	

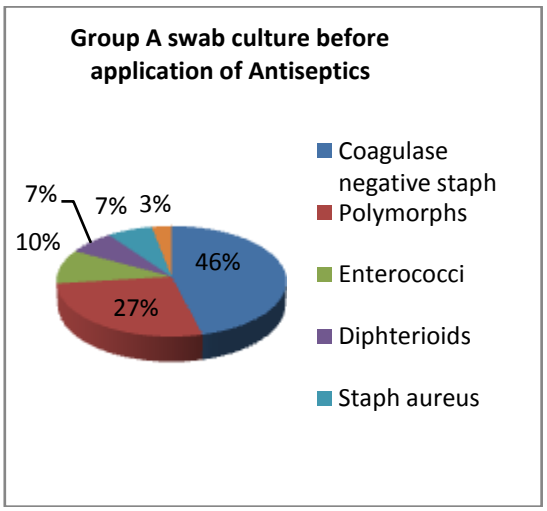

Fig-4

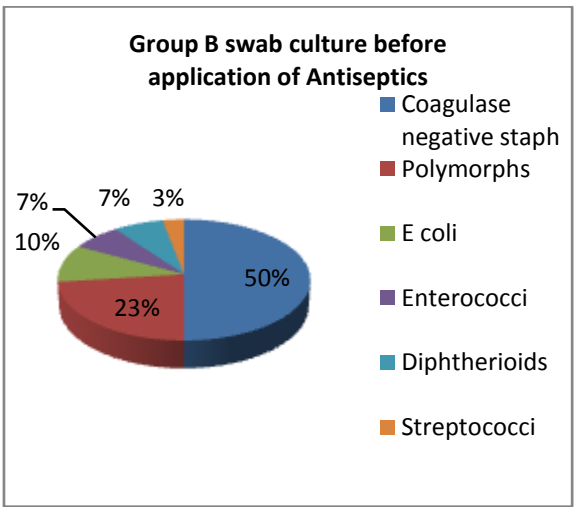

Fig-5

Table 5: Comparison of microbiological swab data collected after application of antiseptics**.**

Swab 2 culture growth	Group A		Group B	
	No. Of patients	%	No. Of patients	%
Staph aureus	2	6.67	0	0
Ecoli	4	13.33	0	0
No bacterial growth	24	80	30	100
Total	30	100	30	100
Chi square value= 6.67			p value= 0.036	

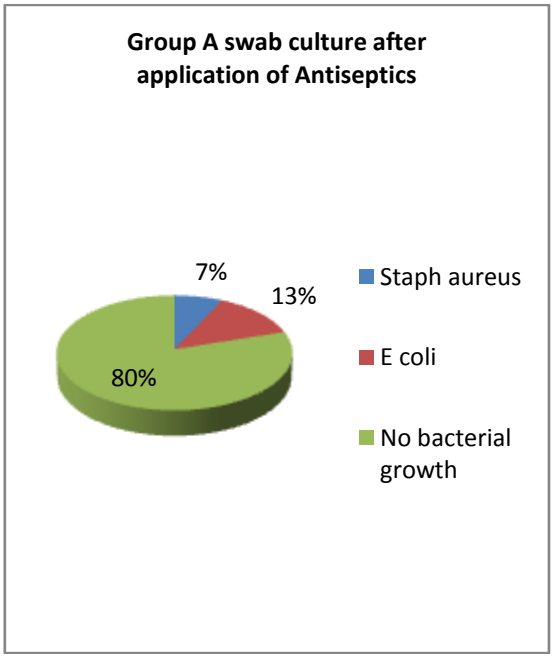

Fig-6

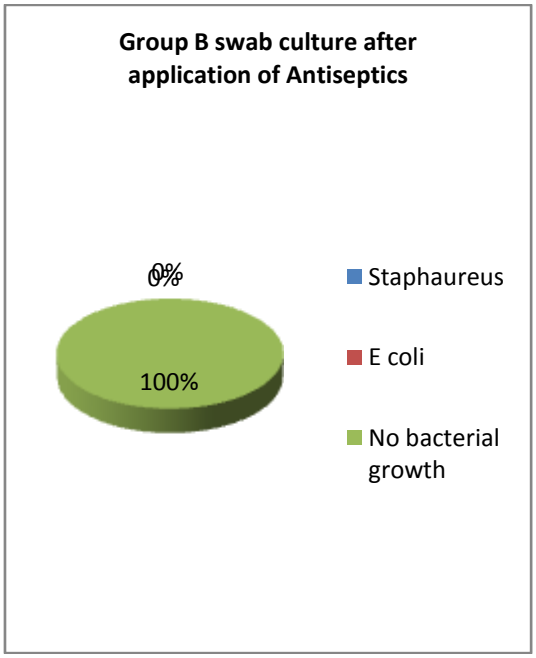

Fig-7

Table 6: Comparison of microbiological swab data collected post-operatively after closure of incision site.

Swab 3 culture growth	Group A		Group B	
	No. Of patients	%	No. Of patients	%
Coagulase negative staph	0	0	1	3.33
Staph aureus	1	3.33	0	0
Diphtherioids	1	3.33	0	0
Bacillus	1	3.33	1	3.33
Streptococci	1	3.33	0	0
No bacterial growth	26	86.67	28	93.33
Total	30	100	30	100
Chi square test= 4.07			p value= 0.539	

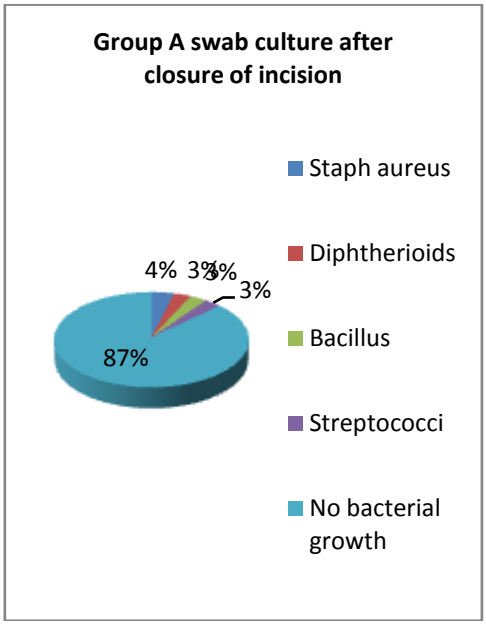

Fig-8

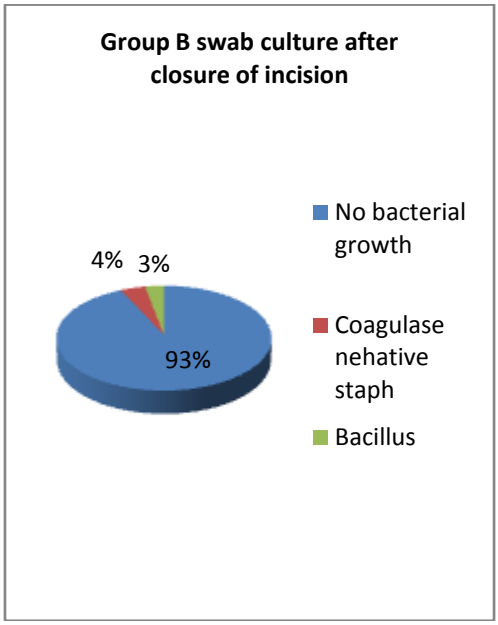

Fig-9

Table 7: Comparison of microbiological data swab collected on 3rd post-operative day

Swab 4 culture growth	Group A		Group B	
	No. Of patients	%	No. Of patients	%
Staph aureus	3	10	1	3.33
Ecoli	1	3.33	0	0
Streptococci	1	3.33	0	0
Pseudomonas aeroginosa	2	6.67	0	0
No bacterial growth	23	76.67	29	96.67
Total	30	100	30	100
Chi square test= 5.192			p value= 0.023	

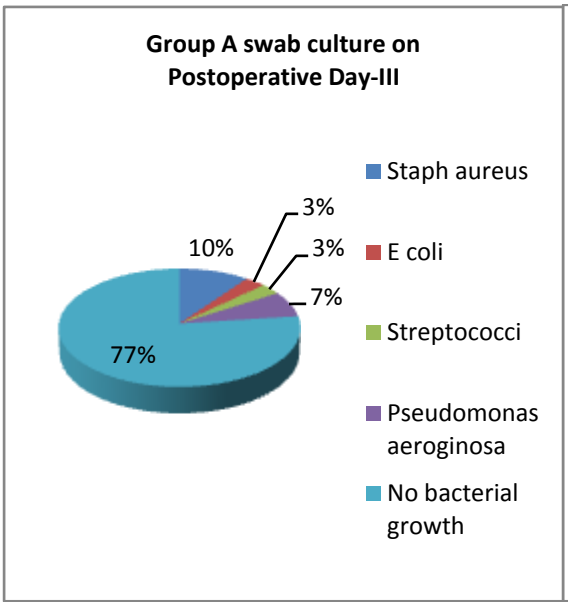

Fig-10

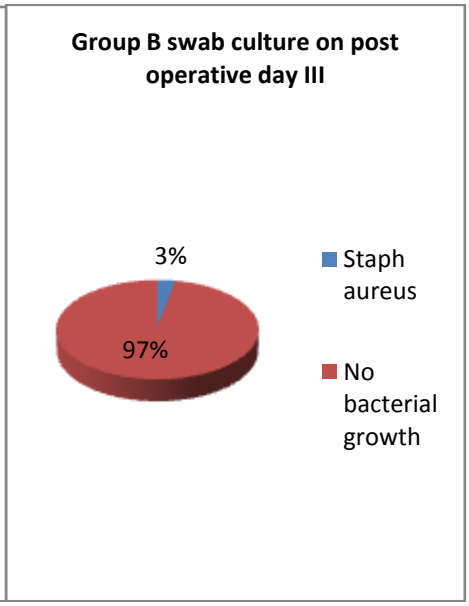

Fig-11

III. Conclusion

The results from the present study show that preoperative skin preparation with chlorhexidine gluconate 2.5% v/v is an ideal regime due to the properties mentioned below.

1. It has a broader antimicrobial spectrum than povidone iodine.
2. Chlorhexidine leaves a protective film where as povidone-iodine leaves no film once rinsed off the skin.
3.Presence of blood or serum protein adversely affect the bactericidal activity of povidone iodine but the bactericidal activity of chlorhexidine is not altered.
4. This regimen is non-irritating to skin and side effects of chlorhexidine are extremely less.
5. This regimen containing has rapid lethal action against both transient and resident flora, especially on staphylococci which are more susceptible to chlorhexidine as compared to povidone iodine .
6. The rate of post-operative wound infections is much lower as compared to povidone iodine .Therefore it can be safely concluded that chlorhexidine should be followed in preoperative skin preparation in clean elective surgeries. Since the superiority of chlorhexidine in decreasing incision site colonization and postoperative wound infection, it is prudent to use this regimen in contaminated and emergency surgeries.

IV. Discussion

There is now increasing evidence that a higher proportion of surgical site infections may be caused by bacteria introduced into deeper skin structures at the time of incision. Proper skin disinfection might, therefore, be one of the keys to reduce the colonization of site of incision and, thus, preventing the development of subsequent infection.

Several randomized, controlled trials investigating different regimens for skin disinfection prior to surgery found chlorhexidine in alcoholic solution more effective in reducing incision site colonization and subsequent wound infection when compared to povidone iodine. This may be explained in part by the greater effect of chlorhexidine on Gram-positive bacteria, especially on coagulase-negative Staphylococci, when compared to other disinfectantsJulia Langgartner et al. conducted a study which showed that skin disinfection with chlorhexidine was associated with the lowest rate of microbial catheter colonization.[8]Similarly this study was done to prove that chlorhexidine was superior to povidone iodine for preoperative skin disinfection.

Grabsch EA et al., studied in-use efficacy of a chlorhexidine in alcohol surgical rub and concluded that chlorhexidine regimen demonstrated excellent bactericidal efficacy throughout an operating list, and was superior to povidone - iodine scrubbing in all aspects.

Linder N et al., compared disinfection with 10% povidone – iodine versus 0.5%chlorhexidine gluconate in 70% isopropanol in the neonatal intensive care unit and concluded that the use of 0.5% chlorhexidine gluconate solution in 70% isopropanol as a skin disinfectant isjustified in neonatal intensive care units because it is not associated with an increased incidence of infections as opposed to 10% povidone – iodine and is devoid of detrimental effects.[7]Robi o Darouiche and Mathew J wall conducted study showed that chlorhexidine-alcohol has broad spectrum antimicrobial action due to more rapid action,persistent activity despite of exposure to body fluids and residual effect.[10]

Patrick J Culliga conducted study showed that chlorhexidine gluconate was more effective than povidone-iodine in decreasing the bacterial colony counts that were found in the operative field for vaginal hysterectomy.[9]

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