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ORIGINAL ARTICLE

Efficacy of 5% Dextrose+1/2 Saline Versus Ringer Lactate Infusion in Treating Chronic Subdural Hematoma in Terms of Postoperative Pneumocephalus/Subdural Collection after Burr Hole Craniostomy

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Abstract

Objective: To compare the frequency of post-operative pneumocephalus/residual subdural collection after burr hole evacuation of chronic subdural hematoma with 5% dextrose + 1/2 saline infusion versus ringer lactate infusion

Methodology: The study was conducted in the Department of Neurosurgery, PIMS, Islamabad from 01-08-2019 to 31-01-2020. A total of one hundred (n=100) patients of either gender presenting with diagnosis of chronic subdural hematoma, requiring surgical evacuation were included in study and were divided into two groups; Group A given 5% dextrose 1/2 saline intra-op and 1L TDS post-op and Group B given ringer lactate intra-op and 1L TDS post-op. Both groups observed for pneumocephalus and residual subdural collection at 24hr post-op.

Results: Results showed that overall frequency of post-op pneumocephalus and subdural collection was significantly lower in patients who were given 5% dextrose+ 12 saline versus ringer lactate group i.e. 14% vs 38% and 4% vs 16 % respectively which was statistically significant with p-value<0.05.

Conclusion: There is significant negative correlation with 5% dextrose + 12 saline infusion and post-op pneumocephalus and subdural collection incidence as compared to ringer lactate infusion.

Keywords: Subdural hematoma, chronic subdural hematoma, burr hole, pneumocephalus, residual subdural, 5% dextrose, ringer lactate.

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Introduction

Subdural hematoma is presence of blood in subdural space.[1] Chronic subdural hematoma usually begins to develop days or weeks before presentation in elderly patients as acute subdural bleed due to rupture of bridging vessels.[2] The cause may be minor trauma or hypocoagulable state.[3] As trauma is usually minor and bleed is so minimal that it usually gets un-noticed till days or weeks later when patient presents with worsening neurologic deficit as the hematoma liquefies to convert into chronic subdural hematoma and expands due to unbalanced diffusion from aberrant vessels in the hematoma.[4] It usually appears as hypo to iso intense subdural collection on CT brain plain.[5]

Treatment of choice for chronic subdural hematoma is surgical evacuation of hematoma.[6] Though different conservative treatments are tried but they showed controversial results.[7] Different surgical procedures were evaluated but till date trephinization by twist drill craniostomy or burr hole is treatment of choice with or without drain placement.[8]

Proper treatment of chronic subdural hematoma involves evacuation of hematoma and resultant obliteration of subdural space by brain tissue, failure of which results in collection of air i.e. pneumocephalus or fluid/ remnant hematoma in this space.[9] Which is

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associated with increased recurrence and post- op complication.[10] This obliteration of subdural space requires brain to swell up to occupy that space which is usually atrophied because of old age or compressed because of chronic pressure. Different maneuvers are used to assist this swelling like laying patient flat.[11]

There are some studies which support that intra-venous fluid administration improves post-operative outcome after chronic subdural hematoma evacuation but there is limited information about comparison between different fluids to be administered.[12]

As different fluids have different effect on brain volume according to their osmolality and pharmacodynamics, they would have different response on increasing brain volume and as a result obliterating subdural space after chronic subdural hematoma evacuation.[13]

So a study was planned to compare effect of ringer lactate i.e. commonly used isotonic solution with 5% dextrose+1/2 saline i.e. hypotonic solution in management of chronic subdural hematoma. For that purpose a pilot study was conducted on 30 patients in each group at neurosurgery department, Pakistan Institute of Medical Sciences Islamabad during June to November 2018 and it showed significant different results in both groups i.e. 33% patients developed post-operative pneumocephalus or subdural collection in ringer lactate group vs 10% in 55 dextrose + ½ saline group. So a study was planned to find out best fluid to be administered post-operatively after burr hole craniostomy for chronic subdural hematoma evacuation, to decrease post-op subdural hematoma/ pneumocephalus frequency.

Material and Methods

This Randomized controlled trial study was conducted in the Department of Neurosurgery, PIMS Hospital, Islamabad over a period of 06 months from 01-08-2019 to 31-01-2020. Study Comprised of one hundred Patients after fulfilling the inclusion and exclusion criteria.Data was entered on computer software SPSS version 23. Descriptive statistics was used to calculate mean ± SD for quantitative variables like age. Frequencies and percentages were calculated for qualitative variables like gender and frequency of post-op pneumocephalus, residual subdural collection in both groups. Frequency of pneumocephalus and post-op residual subdural collection in both groups were compared by using student Chi-square test. *P*-value ≤0.05 was considered as significant. Effect modifiers like age, gender, duration of deficit was controlled by stratification. Post stratification Chi-square test was applied and *P*-value ≤0.05 was considered as significant.

Results

Total of 100 patients were included in the study i.e. 50 in each group. Out of which 62 were male and 38 were female. In individual study groups male to female ratio was 32:18 in group A and 30:20 in group B. Average age was 64.70 years with std. dev. Of 7.898, ranging from 51years to 79 years. It was 64.62 years in group A (range 51 years-79 years), and 64.78 years in group B (range 52 years-79 years). Duration of neurologic deficit was ranging from 2 to 20 days with mean of 9.97 days. When viewed separately for groups, it came to be "10.14" in group "A" and 9.8 in group "B". Correlation was statistically significant with chi square value of 7.484 and p-value <0.05 and odd ratio came to be 0.266. Post-op Ct scan at 24hr showed incidence of pneumocephalus significantly higher, 38% (19/50) in group "B" i.e. the one provided with lactated ringer vs 14% (7/50) in group "A" i.e. the group provided with 5% dextrose+ 1/5 saline

Table I: Age distribution

Group	Mean	N	SD	Min	Max
A	64.62	50	8.196	51	79
B	64.78	50	7.670	52	79
Total	64.70	100	7.898	51	79

When seen for post-op subdural collection, it was also significantly higher i.e 16% (8/50) vs 4%(2/50) in group "B" vs group "A". It was also statistically significant with chi square value of 4 and p-value was <0.5.

Table II: correlation between post-op pneumocephalus and IV fluids (chi square7.484)

			Yes	No	Total
Group	A	Count	7	43	50
		% within group	14.0%	86.0%	100.0%
	B	Count	19	31	50
		% within group	38.0%	62.0%	100.0%
Total		Count	26	74	100
		% within group	26.0%	74.0%	100.0%

Table III: post-op subdural collection

Yes				No	Total
Group	A	Count	2	48	50
		% within group	4.0%	96.0%	100.0%
	B	Count	8	42	50
		% within group	16.0%	84.0%	100.0%
Total		Count	10	90	100
		% within group	10.0%	90.0%	100.0%

Discussion

Chronic subdural hematoma is one of the commonest illness encountered by most of the neurosurgeons.[1] Usually patients present weeks after the trivial trauma with complaint of gradually worsening neurological deficit.[2] The actual pathogenesis of chronic subdural hematoma is yet not known but different theories are purposed.[3] No matter what the pathogenesis be, this hematoma needs to be evacuated as different medical therapies tried, like bed rest, transamine, atorvastatin, steroids but none has shown any proven efficacy.[4] Different surgical techniques are used like burr hole evacuation, twist drill craniostomy, with or without drain placement, with or without irrigation, craniectomy, membranectomy, endoscopic evacuation. Different procedures are suitable in different scenarios but most commonly used procedure is burr hole evacuation with or without subdural drain placement.[5]

One of the most common complication after CSDH evacuation are post- op pneumocephalus or subdural collection, resulting from inability of brain to expand properly to obliterate this expanded subdural space.[6] To reduce this complication, different maneuvers are used, basically to help brain in expanding like, keeping patient's head down with burr at superior most area during surgery, laying patient flat post-op, increased fluid intake both intravenously and orally.[7] But still, significant number of patients develops this complication post- operatively.[8-12]

Since, different fluids have different effect on brain volume, depending on their osmolality like hyper-osmolal solution like mannitol, 3% saline decreases brain volume by decreasing interstitial fluid, so used to reduce brain edema, while hypo-osmolal fluids like dextrose water or dextrose half saline increases brain volume by increasing interstitial fluids, so this property of hypotonic solutions may be used to help brain regain its normal volume earlier in case of chronic subdural hematoma.[13-15]

Our study showed significant benefit of using 5% dextrose + 12 saline as compared to lactated ringer for hydration of patients with chronic subdural hematoma, in term of both pneumocephalus as well as post-op subdural collection. No patient developed significant side effect or complication.

In term of post-op pneumocephalus, the incidence was 14% vs 38 % respectively, which was statistically significant with p-value <0.05. same was with post-op subdural swelling, which have incidence of 4% vs 16 % respectively with p-value <0.05.

For post-op pneumocephalus, when age stratification was done, all age groups showed decreased incidence in 5% dextrose+1/2 saline group but with p- value<0.05 only significant correlation was seen 51-60 year and 61-70 year group, while in group of >70 year, although there was decreased incidence in 5% dextrose+ ½ saline group i.e. 14% vs 38% but correlation was not significant with p value < 0.05 (p-value 0.472).

With gender stratification, there was significant association in males with p-value < 0.05 but in female, though there was decreased incidence in 5% dextrose+ ½ saline group i.e.16% vs 25% but was not significant with respect to p-value < 0.05 (p-value 0.529).

When stratification for deficit interval done, there was decreased incidence in 5% dextrose+ ½ saline group in all 4 sub-groups but non showed statistically significant association when significant p-value was taken as <0.05. In case of post-op subdural collection, when age, gender and deficit interval stratification was done, all sub-groups showed decreased incidence in 5% dextrose+ ½ saline group, but when p- value < 0.05 was taken as significant, no one showed significant association except for male gender.

To summarize, intra-venous infusion with 5% dextrose+ ½ saline has got significant negative association with post-op pneumocephalus and subdural collection incidence with negative correlation of 0.266 and 0.219 respectively, which also correlates with our pilot study. This decreased incidence is most probably due edematous effect of 5% dextrose+ ½ saline on brain due to its hypotonicity and thus leading to early obliteration of subdural space.

Conclusion

There is significant negative correlation with 5% dextrose+ ½ saline infusion and post-op pneumocephalus and subdural collection incidence as compared to ringer lactate infusion. However, when stratified in sub-groups, only few groups showed statistically significant result, showing need of further research on larger sample sizes. Also, study is required for potential adverse effects and long- term response.

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