

Upright (45°) Versus Supine Position for Intubation in Intracranial Bleed Patients

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Objective: To find out the effective method of endotracheal intubation among patients of intracranial bleed.

Methods: A quasi experimental research was performed at emergency department of Ziauddin University Hospital Karachi. 236 intracranial bleed patients were selected by consecutive sampling, half of them were intubated at upright position (45°) and remaining half at supine position. Patients of musculoskeletal deformities, ischemic stroke and previously intubated were excluded. Success or failure of endotracheal tube was confirmed by measuring oxygen saturation and audible breath sounds on chest.

Results: Success rate of endotracheal placement (p-value <0.001) was high in upright position 115 (97.5%) as compared to supine position 90 (76.3%). Similarly, endotracheal tube placement attempts (p-value <0.001) and completion time (p-value <0.001) was low in upright position 1.1 ± 0.4 and 62.9 ± 24.9 sec as compared to supine position 1.5 ± 0.9 and 90.2 ± 67.9 sec.

Conclusion: Endotracheal intubation of intracranial bleed patient at upright position is more successful, effective, less painful in terms of number of attempts and less time consuming as compared to supine position.

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Keywords: Endotracheal intubation; intracranial bleed; emergency; upright; supine.

1. INTRODUCTION

Intracranial bleed is one of the common health related problem of emergency associated with high risk of morbidity and mortality. Intracranial bleed is perhaps the most major issue of emergency division in which blood accumulation appears either in cranial vault or in parenchyma or in meningeal spaces. Intracranial bleed is among the most dangerous issue managed by physicians in emergency and provision of intensive care can diminish the increasing risk of life-long disability, mortality and can enhance the outcome [1-3].

Intracranial bleed prevalence is high in low income countries as compared to high income countries, ranges from 12-15 in every 100000 cases including 350 hypertensive hemorrhages cases in every 100000 cases. It is estimated that $\geq 7,000$ surgeries per year are done in United States due to intracranial bleed, whereas mortality rate is higher ≥ 20000 per year. Approximately 44% of total deaths are reported within thirty day of intracranial bleed [4-6].

Emergency of hospital is the primary spot where patients are brought and requires clinical treatment. Intracranial bleed patients require immediate management of vital functional of body in order to decrease the risk of complications and mortality [6-7]. Airway management of intracranial bleed patient is immediately performed through endotracheal intubation, mostly performed in supine position and associated with high risk of complications such as non-functioning, misplacement or difficult, hypoxemia, hypotension, infection, organs injury, bronchopleural fistula, etc. [8-9]. Position of endotracheal intubation in intracranial bleed patient is very important and believed that can decrease the risk of complications such as upright position at 45° is associated with less risk of complications than supine position [10-12].

The study focus on finding an effective method of endotracheal intubation by placing intracranial bleed either at upright position with angle of 45° or at supine position. Few studies are performed around the world on comparison of both positions of endotracheal intubation and reported the superiority of upright position in terms of higher success rate with less complications. However, data is limited and requires more research to establish the superiority of upright position of

endotracheal intubation in intracranial bleed patients.

2. METHODOLOGY

A quasi experimental research was performed at emergency department of Ziauddin University Hospital Karachi during the period of six months from 4th May 2020 to 3rd November 2020. Consecutive sampling technique was used for selection of two hundred and thirty six patients from emergency department. Patients were randomly placed either in upright position group or in supine position group.

Intracranial bleed patients of either gender with age of 11 to 90 years, presented with different clinical symptoms and confirmed on computed tomography were included in study whereas patients of musculoskeletal deformities, ischemic stroke and previously intubated were excluded. First attempt success was placement of endotracheal tube in first attempt while two or more attempts were labelled as difficult attempts and in case of ten minutes failure in placing endotracheal tube was declared failure of endotracheal intubation. Success of endotracheal tube was confirmed by measuring oxygen saturation ($\geq 94\%$) and audible breath sounds on chest while failure of endotracheal tube was confirmed by measuring oxygen saturation ($< 94\%$) and audible breath sounds over epigastrium. Data interpretation was done with the help of statistical package for social sciences (SPSS version 25).

3. RESULTS

In this study, out of two hundred and thirty six intracranial bleed patients, no significant difference ($p=0.675$) was evaluated in gender of patients distributed in upright or supine position. Most of the patients were male 79 (66.9%) vs 82 (69.5%) whereas females were low in number 39 (33.1%) vs 36 (30.5%) in upright and supine group respectively. Mean of the age was significantly vary ($p=0.044$) in upright 51.2 ± 16.5 years and in supine 46.9 ± 16.5 years group. Commonly reported symptom was low level of consciousness 118 (100.0%) vs 118 (100.0%) followed by seizures 113 (95.8%) vs 118 (100.0%) ($p=0.024$), focal neurological deficit 115 (97.5%) vs 118 (100.0%) ($p=0.081$). severe headache 88 (74.6%) vs 94 (79.7%) ($p=0.352$) and severe hypertension 79 (66.9%) vs 56 (47.5%) ($p=0.002$) (Table 1).

Table 1. Patient demographics and presenting complaints in intracranial bleed patients

Variables	Upright (45°) Position (n=118)	Supine Position (n=118)	P-value
Gender			
Male	79 (66.9%)	82 (69.5%)	0.675
Female	39 (33.1%)	36 (30.5%)	
Age			
Mean ± SD	42.3 ± 16.7	41.4 ± 16.4	0.044*
11-30	18 (15.3%)	27 (22.9%)	0.114
31-50	27 (22.9%)	36 (30.5%)	
51-70	64 (54.2%)	50 (42.4%)	
> 70	9 (7.6%)	5 (4.2%)	
Low Level of Consciousness			
Yes	118 (100.0%)	118 (100.0%)	--
No	0 (0.0%)	0 (0.0%)	
Sudden and Severe Headache			
Yes	88 (74.6%)	94 (79.7%)	0.352
No	30 (25.4%)	24 (20.3%)	
Severe Hypertension			
Yes	79 (66.9%)	56 (47.5%)	0.002*
No	39 (33.1%)	62 (52.5%)	
Seizures			
Yes	113 (95.8%)	118 (100.0%)	0.024*
No	5 (4.2%)	0 (0.0%)	
Focal Neurological Deficit			
Yes	115 (97.5%)	118 (100.0%)	0.081
No	3 (2.5%)	0 (0.0%)	

*P-values are calculated on Independent sample t test and Chi-square test. * P-values are significant ≤ 0.05*

Mean of endotracheal attempts was significantly vary ($p < 0.001$) 1.1 ± 0.4 vs 1.5 ± 0.9 with significantly vary mean time ($p < 0.001$) 62.9 ± 24.9 vs 90.2 ± 67.9 seconds in upright and supine group respectively. Oxygen saturation was also significantly vary before ($p = 0.002$) 83.2 ± 4.4 vs 80.7 ± 7.4 and after ($p = 0.010$) 98.1 ± 2.1 vs 97.4 ± 2.1 endotracheal intubation in upright and supine group respectively. Success rate was also significantly high ($p < 0.001$) in upright position 115 (97.5%) vs supine position 90 (76.3%) (Table 2).

Similar pattern was observed in successful rate of endotracheal intubation. Significant difference was observed in successful rate of male ($p < 0.001$), female ($p = 0.018$), age group 11-30 years ($p = 0.006$), age group 31-50 years ($p = 0.003$), age group 51-70 years ($p = 0.008$), difficult attempts of endotracheal intubation ($p < 0.001$) and > 1 min of endotracheal intubation ($p < 0.001$) (Table 3).

4. DISCUSSION

In current study, focus was on successful placement of endotracheal intubation with ease.

Intracranial bleed patients were selected from emergency and intubated either at upright or supine position. Successful endotracheal intubation rate was high 97.5% at upright intubation as compared to supine intubation 76.3% ($p\text{-value} < 0.001$). Ease of endotracheal intubation was also high with upright intubation as compared to supine intubation as rate of mean attempts of intubation was low 1.1 ± 0.4 with upright intubation and high 1.5 ± 0.9 with supine intubation ($p\text{-value} < 0.001$). Rate of first attempt successful endotracheal intubation was also high 94.1% at upright intubation as compared to supine intubation 75.4%. Turner JS, et al. also finds the 85.6% vs 65.8% first attempt successful intubation with upright and supine intubation respectively [12]. Gudivada KK, et al. also finds the 93.0% vs 91.0% first attempt successful intubation with head elevated and sniffing intubation respectively [13]. Turner JS, et al. also finds the 97.6% vs 90.5% first attempt successful intubation with upright and supine intubation respectively [14]. More difficult endotracheal intubation attempts were performed with supine intubation 29 (24.6%) then upright intubation 7 (5.9%), among which successful rate was also high 3.5% at upright intubation as

Table 2. Endotracheal intubation in intracranial bleed patients

Variables	Upright (45°) Position (n=118)	Supine Position (n=118)	P-value
Endotracheal Intubation Attempts			
Mean ± SD	1.1 ± 0.4	1.5 ± 0.9	<0.001*
First	111 (94.1%)	89 (75.4%)	<0.001*
Difficult	7 (5.9%)	29 (24.6%)	
Time Taken For Endotracheal Intubation Completion (sec)			
Mean ± SD	62.9 ± 24.9	90.2 ± 67.9	<0.001*
≤ 1 min	101 (85.6%)	88 (74.6%)	0.034*
> 1 min	17 (14.4%)	30 (25.4%)	
Oxygen Saturation Before Endotracheal Intubation (%)			
Mean ± SD	83.2 ± 4.4	80.7 ± 7.4	0.002*
Oxygen Saturation After Endotracheal Intubation (%)			
Mean ± SD	98.1 ± 2.1	97.4 ± 2.1	0.010*
Endotracheal Intubation Outcome			
Successful	115 (97.5%)	90 (76.3%)	<0.001*
Failure	3 (2.5%)	28 (23.7%)	

P-values are calculated on Independent sample t test and Chi-square test. □ P-values are significant ≤ 0.05

Table 1. Endotracheal intubation outcome with different variables in intracranial bleed patients

Variables	Upright (45°) Position (n=118)		Supine Position (n=118)		P-value
	Successful (n=115)	Failure (n=3)	Successful (n=90)	Failure (n=28)	
Gender					
Male	77 (67.0%)	2 (66.7%)	61 (67.8%)	21 (75.0%)	<0.001*
Female	38 (33.0%)	1 (33.3%)	29 (32.2%)	7 (25.0%)	0.018*
Age					
11-30	18 (15.7)	0 (0.0)	18 (20.0)	9 (32.1)	0.006*
31-50	27 (23.5)	0 (0.0)	26 (28.9)	10 (35.7)	0.003*
51-70	62 (53.9)	2 (66.7)	41 (45.6)	9 (32.1)	0.008*
> 70	8 (7.0)	1 (33.3)	5 (5.6)	0 (0.0)	0.439
Endotracheal Intubation Attempts					
First	111 (96.5)	0 (0.0)	89 (98.9)	0 (0.0)	--
Difficult	4 (3.5)	3 (100.0)	1 (1.1)	28 (100.0)	<0.001*
Time Taken For Endotracheal Intubation Completion (sec)					
≤ 1 min	100 (87.0)	1 (33.3)	87 (96.7)	1 (3.6)	0.922
> 1 min	15 (13.0)	2 (66.7)	3 (3.3)	27 (96.4)	<0.001

*P-values are calculated on Chi-square test. * P-values are significant ≤ 0.05*

compared to supine intubation 1.1% (p-value=<0.001). Khandelwal N, et al. also finds the 3.0% vs 7.7% difficult intubation with upright and supine intubation respectively [11]. As we know, very few studies are performed on comparison of both positions of endotracheal intubation and all of them including our study findings reported the similar results with higher success rate with first attempt and less difficult attempt at upright intubation as compared to supine intubation [11-15].

In current study, mean time of completion of endotracheal intubation in intracranial bleed

patient was low 62.9 ± 24.9 sec with upright intubation and high 90.2 ± 67.9 sec with supine intubation (p-value=<0.001). In upright intubation 17 intracranial bleed patients were intubated in more than one minute, out of which 15 were successfully intubated and only 2 were failed to intubate, whereas in supine intubation 30 intracranial bleed patients were intubated in more than one minute, out of which only 3 were successfully intubated and 27 were failed to intubate (p-value=<0.001). So, upright intubation is more successful and less time consuming as compared supine intubation.

Another important and significant finding of our study was that most of the male patients (79 vs 82) were presented in emergency with intracranial bleed as compared to female patients (39 vs 36) in upright and supine intubation group respectively. Similar pattern was also observed in successful endotracheal intubation. Rate of endotracheal intubation was high in male intracranial bleed patients 67.0% vs 67.8% (p-value=<0.001) as compared to female intracranial bleed patients 33.0% vs 32.2% (p-value=0.018) in upright and supine intubation group respectively. Other studies such as Khandelwal N, et al. and Turner JS, et al. also reported the similar pattern [11,12]. Male patients are mostly presented with intracranial bleed because they are mostly involved in driving, road accidents and fights, whereas high successful rate of endotracheal intubation may be due to reasons that they are more obedient and follow the physicians instructions as compared to females.

5. CONCLUSION

Our study finds the statistically significant association of upright endotracheal intubation with high successful rate, high first attempt success, less difficult attempts with high success and less time to complete intubation and confirms that endotracheal intubation of intracranial bleed patient at upright position is more successful, effective, less painful in terms of number of attempts and less time consuming as compared to supine position.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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