

A survey of a population of anaesthesiologists from South India regarding practices for rapid sequence intubation in patients with head injury

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ABSTRACT

Background and Aims: Evidence and utility of the individual steps of the rapid sequence induction and tracheal intubation protocols have been debated, especially in the setting of traumatic brain injury. The purpose of this survey was to determine preferences in the current approach to rapid sequence intubation (RSI) in head injury patients among a population of anaesthesiologists from South India. **Methods:** A questionnaire was E-mailed to all the members of the Indian Society of Anaesthesiologists' South Zone Chapter to ascertain their preferences, experience and comfort level with regard to their use of rapid sequence intubation techniques in adult patients with head injury. Participants were requested to indicate their practices for RSI technique for a head-injured patient upon arrival at the Emergency Medical Services department of their hospital. **Results:** The total response rate was 56.9% (530/932). Of the total respondents, 35% of the clinicians used cricoid pressure routinely, most respondents (68%) stated that they pre-oxygenate the patients for about 3 min prior to RSI, thiopentone (61%) and propofol (34%) were commonly used prior to intubation. Rocuronium was the muscle relaxant of choice for RSI among the majority (44%), compared to succinylcholine (39%). Statistical analyses were performed after the initial entry onto a spreadsheet. Data were summarised descriptively using frequency distribution. **Conclusion:** In a rapid sequence intubation situation, the practice differed significantly among anaesthesiologists. Owing to disagreements and paucity of evidence-based data regarding the standards of RSI, it is apparent that RSI practice still has considerable variability in clinical practice.

Key words: Anaesthesiologists, cricoid pressure, endotracheal intubation, head injury, rapid sequence intubation

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INTRODUCTION

Advanced airway management is of critical importance in the resuscitation of patients with head injuries with a depressed level of sensorium. Rapid sequence intubation (RSI) is the nomenclature for the virtual simultaneous administration of a potent sedative agent and a neuromuscular blocking agent to induce unconsciousness and motor paralysis for the purpose of facilitating endotracheal intubation. The aim of the current survey was to explore the prevalent techniques for RSI among anaesthesiologists who attend intubation calls in the Emergency Medical Services department among a population of

anaesthesiologists in South India. Such appraisal of prevalent clinical practice helps in establishing the current standard of care among this population of anaesthesiologists.

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METHODS

We identified key domains in the area of rapid sequence intubation using the 15-step rapid sequence intubation technique published in 1970 by Stept and Safar.^[1] These included the types of drugs, the neurological state of the head injured patient and the use of manoeuvres to prevent aspiration. Using these domains, we generated a list of questions. The survey also contained questions relating to physician demographics, principally, the professional grade of the responder. An iterative process was applied to refine the questions.

We assessed the comprehensiveness and clarity of the questionnaire. A group of four anaesthesiologists not involved in the development of the questionnaire completed the assessment. As a result of this process, we made changes to the original instrument to improve clarity. To ensure that the topics covered in the survey were in accordance with the stated objectives, a different group of two anaesthesiologists were asked to assess the comprehensiveness of the domains and items addressed in the questionnaire and to comment on the survey. No key domains were identified as missing. The institution approved the questionnaire (Appendix 1). Following the approval by the Institutional Review Board, an E-mail containing the questionnaire as an attachment was sent to all members registered on the database of the South Zone Chapter of the Indian Society of Anaesthesiologists (ISA). Monthly reminders were sent for 3 months from the initial distribution of the questionnaire to enhance the response rates from members who had not replied back. Exclusion criteria were the members whose E-mail IDs were not recorded in the database and inactive ISA members. It was indicated in the E-mail that completion of the questionnaire and mailing it back to us would imply consent to participate in the research study.

Participants were presented with a clinical scenario of traumatic brain injury in a previously healthy young adult and asked to indicate their practice of choice when considering a rapid sequence intubation (RSI) technique for airway management in the patient. The questionnaire consisted of 17 multiple-choice questions. Survey questions solicited provider information regarding the use of nasogastric or orogastric tubes, patient head positioning, pre-oxygenation, application of cricoid pressure, administration of opioids, induction agents,

muscle relaxants and adjuvant medications. The questionnaire further enquired whether clinicians do formal Glasgow coma scale (GCS) assessment prior to endotracheal intubation in these patients. Information was also sought on vascular access and cervical spine protection measures.

Statistical analyses were performed after initial entry onto a Spreadsheet. Data were summarised descriptively using frequency distribution.

RESULTS

Figure 1 represents how the E-mail responses were obtained after initial requests and after subsequent reminders. It also shows the number of participants who answered all questions of the survey and those who submitted incomplete responses. Blank responses to questions were coded as missing data. Demographic data with regard to the level of training and clinical experience are summarised in Table 1.

With regard to the GCS, 70% respondents replied that they would do a formal GCS assessment prior to intubating such patients, whereas the rest 30% did not consider a formal GCS recording important prior to RSI [Table 2]. For the use of the gastric tube however, the responses were more heterogeneous with 207 (39%) admitting to its routine use, 132 (25%) saying that they do not use it routinely, only 2 (<1%) declaring

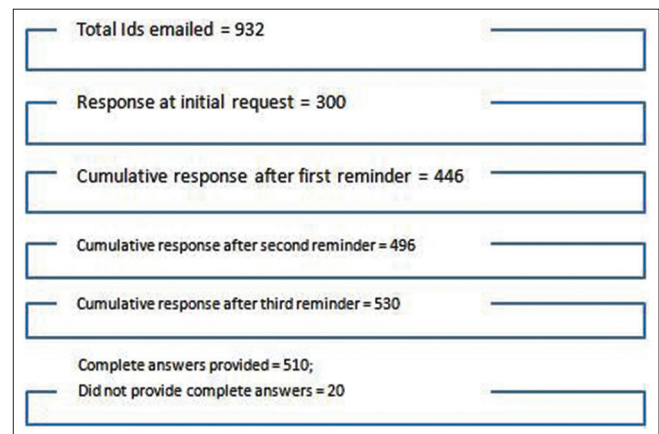


Figure 1: Vertical box diagram representing how the response rates were obtained from participants at initial introduction of the survey and through subsequent reminders

Table 1: Grade of study respondents		
Grade	Number of participants	Percentage
Consultant	373	70.4
Resident	157	29.6
Total	530	100

that they never use it and 189 (35%) responding that they use it only if it is already in place [Table 3], with 40 of those who use it routinely, mentioning that they would put a nasogastric tube if there is no clinical evidence of base of skull fracture, whereas others did not specify anything.

The practice of head of the bed elevation by 30 degrees prior to RSI was favoured by 410 (77%) of the respondents [Table 3]. The rest 120 (23%) indicated that they intubated their patients supine. None of the respondents indicated any other positioning details, such as the use of pillow and head ring.

The data on pharmacological aids to intubation was also variegated [Table 4]. Of the induction agents used, the most commonly employed was thiopentone, used by 325 (61%) of responders, whereas propofol was preferred by 181 (34%) responders and the rest used etomidate or ketamine [Table 4]. The most common muscle relaxant used to facilitate intubation was rocuronium, used by 233 (44%) respondents, whereas succinylcholine was preferred by 206 (39%) providers, the rest using other relaxants such as vecuronium and atracurium [Table 4].

In a situation where peripheral venous access was not possible [Table 5], 345 (65%) respondents stated that they would intubate first and then proceed to secure central venous access and 165 (31%) suggested that their preferred sequence would be the reverse and the rest did not respond to the query. The hard cervical collar was routinely used whereas intubating these patients by only 98 (18.5%) of respondents, 164 (31%)

Table 2: Glasgow coma scale assessment

GCS assessment	Number of participants	Percentage
Formal GCS assessment	373	70.4
No formal GCS assessment	157	29.6

GCS – Glasgow coma scale

Table 3: Methods of preventing aspiration

Measures	Number of participants	Percentage
Gastric tube		
Use routinely	207	39
Do not use routinely	132	25
Never use it	2	0.4
Use it only if it is already in place	189	35
Remove it if already there	0	0
Head position		
Head-end of bed elevated to 30°	410	77
Supine	120	23
Others (pillow, head ring, etc.)	0	0

preferred using manual inline stabilisation, whereas 268 (50.5%) respondents stated that they used

Table 4: Pharmacological aids to intubation

Drugs	Number of participants	Percentage
Opioid use		
Use	248	47
Do not use	282	53
Choice of opioids*		
Fentanyl	225	91
Others	23	9
Adjunctive drug usage to reduce haemodynamic response		
Yes	350	66
No	180	34
Choice of adjuncts†		
IV lignocaine	218	62
Others	123	35
No response	9	3
Induction drug		
Thiopentone	325	61.3
Propofol	181	34.2
Others	13	2.5
No response	11	2
Induction dose administered as		
Precalculated dose, fast bolus	161	30
Slow or titrated to clinical response	358	68
Choice of muscle relaxants		
Succinylcholine	206	39
Rocuronium	233	44
Others	80	15
No response	11	2

*Among those using opioids, †Among those using adjuncts

Table 5: Central venous access, cervical spine protection, preoxygenation and preintubation ventilation components

Parameter/measure	Number of participants	Percentage
If peripheral access impossible		
Establish central venous access before intubation	165	31
Intubate first and then establish central venous access	345	65
No response	20	4
Cervical spine protection		
Manual in-line axial stabilization	164	31
Hard cervical collar	98	18.5
Only if suspicion of cervical spine injury	268	50.5
Preoxygenation		
3 min	361	68
5 min	97	18
To prespecified end-tidal oxygen concentration	49	9
No response	23	5
Preintubation ventilation after induction		
Never	41	8
Routinely	122	23
If required	367	69

cervical spine protection only if there was suspicion of cervical spine injury. The use of pre-oxygenation in these patients varied from 3 min in 361 (68%) respondents to 5 min in 97 (18%). The use of end-tidal O₂ concentration as adequacy of pre-oxygenation was preferred by 49 (9%), whereas the rest preferred not to respond to this section. Pre-intubation manual ventilation was never used by 41 (8%) of the clinicians, whereas 122 (23%) admitted to routinely ventilating their patients with positive pressure prior to intubation. The majority of respondents, 367 (69%) stated that they used positive pressure mask ventilation prior to intubation when required, implying probably that they would do so if their patients were desaturating.

Only 35% of clinicians responding to the survey used cricoid pressure routinely while intubating these patients, whereas the rest 65% suggested that they would use it only if RSI medications were being concomitantly administered [Table 6]. Approximately, 45% of respondents indicated that the maximum force to be applied during the administration of cricoid pressure should be 40 Newtons, whereas only 7% answered 30 Newtons and 29% said they were not aware of the maximum recommended force [Table 6].

DISCUSSION

Our results indicate that majority of respondents did not routinely use cricoid cartilage pressure [Table 6]. The utility of cricoid pressure, its efficacy and the ability of operators to consistently employ such pressure is being questioned in recent years.^[2,3] Current literature seems to suggest that the portion of the gastrointestinal tract at the level of cricoid ring is the post-cricoid hypopharynx and not the oesophagus.^[4] Rice *et al.* introduced the idea of the 'cricoid pressure unit' and discredit the logic of effectiveness of the cricoid pressure due to previously reported displacement of oesophagus upon the application

of pressure to the airway.^[5] Awareness of the correct amount of force required to be applied on the cricoid ring is also important for successful intubation while providing best prevention from aspiration. Usual recommendations suggest application of a force of around 10 N prior to administration of drugs, followed by an increase in force to 30 N once the patient loses consciousness. If correctly enforced and carefully gauged, the cricoid pressure drill may provide an effective barrier against potential gastric regurgitation, and, therefore, remains an important step of conventional rapid sequence intubation.^[6] The item related to the amount of force to be applied was meant to test awareness of the correct pressure application. We recognise that in actual practice, it is impossible to quantify the amount of cricoid pressure applied without a mechanical device although certain clinical approximates have been described. While inadequate application may not be effective, overenthusiastic efforts might obstruct ventilation and impede laryngoscopy. Moreover, sustained application of cricoid pressure as recommended at 30 N might cause arm fatigue in a few minutes and subsequent improper application, but more practice and proper arm positioning might improve performance.

Most respondents (68%) stated that they pre-oxygenate these patients for about 3 min prior to RSI, and following administration of pharmacological agents to facilitate RSI, about 69% reportedly ventilate their patients if required, which we interpret as the occurrence of any hypoxia in the intervening period. Gentle intermittent positive pressure ventilation before rapid sequence intubation has been recommended in recent publications, especially in a specific group of patients such as obese, pregnant, paediatric and critically ill patients.^[7] If the tracheal intubation attempt fails, severe hypoxia could result even before starting the failed intubation protocol. Pre-emptive mask ventilation employing low inspiratory pressures (<20 cm H₂O) before tracheal intubation may be deemed reasonable, if not imperative, in these situations. Barring such situations, there are no other indications for routine use of manual ventilation prior to RSI. In scenarios where a difficult intubation is a real possibility, alternative options such as awake fiberoptic intubation under regional anaesthesia may be explored. Efficient pre-oxygenation, either for 3–5 min or with three vital capacity (VC) breaths will replace alveolar air with 100% oxygen. In the trauma setting, 5 min may be considered too long since most of these patients require rapid airway control and

Table 6: Cricoid pressure

Cricoid pressure	Number of participants	Percentage
Cricoid pressure		
Routinely	185	35
Not routine	345	65
Maximum force applied with cricoids pressure (N)		
10	48	9
20	52	10
30	36	7
40	241	45
Do not know	153	29

placement of a definitive airway. Further, the VC technique may not be appropriate in head injured patients, since it requires an awake and alert patient cooperating with the clinician. Hence, pre-oxygenating up to 3 min was the most common option selected by most respondents.

The current study demonstrates that [Table 4] thiopentone (61%) and propofol (34%) were the most common agents used prior to intubation. Concerns about haemodynamic stability in trauma patients might have encouraged the use of slow and titrated delivery of the induction agent for the majority of clinicians (68%) as compared to intra-venous (IV) push of a pre-calculated dose (30%), which is the norm for most other RSI situations.

The current survey shows that in contrast to previously conducted surveys^[8] and a recent Cochrane review comparing rocuronium to succinylcholine for RSI,^[9] in which succinylcholine was favoured, rocuronium was the muscle relaxant of choice for RSI among the majority of our respondents, with about 44% choosing the drug over succinylcholine (39%) as shown in Table 4. Current evidence suggests there are no statistical differences in intubation conditions between succinylcholine and 1.2 mg/kg of rocuronium.^[9]

Utilisation of adjuvant therapeutics in RSI has also received variable acceptance over time. The intent of the survey was to find out how many respondents used adjuvant drugs prior to RSI and what medications were preferred in this regard. We show [Table 4] that only 47% respondents chose opioids as part of their RSI regimen. The majority (91%) of respondents, who used opioids during RSI, chose fentanyl as opposed to other narcotics. The idea behind employing opioids immediately prior to RSI is to reduce cardiovascular responses to the stimulation of intubation, and as such, the ideal opioid for this purpose should have a quick onset of action, be short-acting and highly potent. Since alfentanil and remifentanil are still not widely available in India, fentanyl was the natural choice. Our survey also demonstrated that fairly substantial numbers of respondents favoured the use of IV lidocaine as another pharmacological adjunct. However, whether the use of such drug was only to counter the haemodynamic response to intubation or to reduce the pain on injection associated with certain drugs like propofol is something that cannot be elucidated from the data we collected. The 'lidocaine spray' technique, short-acting beta blockers, nitrates,

etc., were less often chosen in our survey (35% accounting for combinations of these techniques).

Differences in practice in relation to aspiration prevention may be attributable to experience of the practitioner with regard to the specific conditions related to the pathophysiology of this group of patients. We are not aware of any study showing significant variation in the rates of aspiration associated with different positions in which RSI is used. However, further increase in intracranial pressure may be prevented in these patients with reduced cerebral compliance, either by elevation of the head end immediately following intubation or by performing the tracheal intubation in the head elevated position.^[10] Of course, while doing this, one need to take care that hypotension is prevented, the mean arterial pressure is maintained between 80 and 100 mm Hg and the cerebral perfusion pressure above 60 mm Hg since hypoperfusion significantly worsens outcomes in these patients.

About 70% of respondents suggested that they would undertake RSI in a patient with head injury based on a formal assessment of the GCS, whereas the rest 30% indicated that the decision to intubate these patients would not be based on GCS. This difference in clinical decision-making could have its moorings in the protocols of the Brain Trauma Foundation which recommend that patients with GCS ≤ 8 need airway protection, as opposed to the Advanced Trauma Life Support guidelines which treat intubation under the 'A' step of 'ABCDE', with GCS assessment being a part of 'D' or disability assessment, much after airway issues have been tackled.

Limitations of the survey include the low (57%) response rate despite repeated reminders. This response rate is, however, better than that of a Canadian airway survey done recently.^[11] Moreover, the survey instrument was distributed mainly to anaesthesiologists who were registered on the database of the South Zone Chapter of the ISA, potentially acquiring regional overtones. Further, the survey was disseminated only via E-mail and not via hard copy or a database. The above limitations can lead to selection biases and limit the implications of our results.

CONCLUSION

There is a lack of agreement between various anaesthesia practitioners with respect to the best

practices for RSI, a technique which possibly is influenced by local practices and availability of resources rather than generalised evidence-based practice. It is necessary to emphasise the importance of insightful establishment of local standards of care based upon sound knowledge, adequate proficiency and perspective to customise RSI practices to the unique clinical needs of individual patients and to seek appropriate senior support if such modifications are outside the bounds of familiar practice.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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APPENDIX

Appendix 1

Please tick (ü) one or more of the provided responses as applicable

1. Grade of training
Consultant/Resident
2. Formal assessment of Glasgow coma scale prior to intubation
Yes/No
3. Gastric tube
 - Use routinely (specify nasogastric or orogastric)
 - Do not use routinely
 - Never use
 - Keep it in place if already there
 - Remove it if already there
4. Head position
 - Head-end of bed elevated to 30°
 - Supine
 - Others (specify: Pillow, head ring or other positioning details)
5. If peripheral venous access impossible
 - Establish central venous access and then proceed to intubate
 - Intubate first followed by central venous access
6. Cervical spine protection
 - Manual in-line axial stabilization
 - Hard cervical collar
 - Not routine; only if suspicion of cervical spine injury
7. Preoxygenation
3 min/5 min/To prespecified end-tidal oxygen concentration
8. Pre-intubation ventilation before RSI
Never/Routinely/When required
9. Cricoid pressure
Routinely/Not routine
10. Maximum force applied with cricoids pressure
10 Newtons/20 Newtons/30 Newtons/40 Newtons/
Don't know/Other (specify)
11. Opioids prior to RSI
Yes/No
12. If yes to 12, choice of opioids
Fentanyl/Others (specify)
13. Adjuvant drug use
Yes/No
14. If yes to 14, choice of adjuvants
Lignocaine/Others (specify)
15. Induction agent
Thiopentone/Propofol/Others
16. Induction agent administered as
 - Precalculated dose, fast bolus
 - Slow or titrated to clinical response
17. Muscle relaxant
Succinylcholine/Rocuronium/Others (specify)