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RENAL INJURIES

Vidur Bhalla[1], A K Attri[2]

Abstract

Worldwide trauma is the leading cause of mortality & morbidity particularly in young population. Approximately 10% of the abdominal injuries due to external trauma involve the kidneys. Advances in radiographic staging, improvements in hemodynamic monitoring, validated renal injury scoring system has allowed successful non-operative management strategies for renal preservation. Majority of blunt and many penetrating injuries to the kidneys no longer require surgical intervention despite association with other visceral injuries.

Key Words : Abdominal Trauma ;Renal Trauma; Genitourinary Trauma

Introduction

Blunt renal injuries are most often caused by motor vehicle accident, fall from height and assault. Rapid deceleration during trauma can cause vascular damage resulting in renal artery thrombosis, renal vein disruption, or renal pedicle avulsion. Major renovascular injuries, although exceedingly rare, occur at retroperitoneal points of fixation such as the renal hilum or ureteropelvic junction

Penetrating renal injuries come from gunshot and stab wounds. A penetrating wound to the upper abdomen or lower chest should alert the physician to renal injury. In fact, trauma to the anterior axillary line is more prone to damage important renal structures like the renal hilum and pedicle, compared with the posterior axillary line more often resulting in parenchymal injury

Hematuria

Hematuria (whether gross or microscopic > 5 RBC/HPF) is the best indicator of urinary system injury. However, the degree of hematuria and the severity of the renal injury do not correlate consistently. In 36% of renal vascular injuries from blunt trauma, hematuria is absent[1]. On the other hand, gross hematuria has been observed with renal contusions, although it is more likely to be associated with a significant renal parenchymal injury.

Staging

Proper staging by imaging is essential for nonoperative management of renal injuries

Indications for Renal Imaging

1. All blunt trauma patients with gross hematuria
2. Patients with microscopic hematuria and shock (systolic blood pressure <90 mm Hg any time during evaluation and resuscitation).
3. Penetrating injuries with any degree of hematuria.
4. Pediatric patients (< 16 years) sustaining blunt renal trauma with any degree of hematuria. Children have a high catecholamine output after trauma, which maintains blood pressure until

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approximately 50% of blood volume has been lost. Therefore, shock is not a useful parameter in children to determine the need of imaging.

Imaging Studies

The imaging study of choice for renal trauma is contrast-enhanced computed tomography (CT) which is considered the gold standard for genitourinary imaging in renal trauma[3,4] Highly sensitive and specific, CT provides the most definitive staging information: Parenchymal lacerations are clearly defined; extravasation of contrast-enhanced urine can easily be detected, associated injuries to the bowel, pancreas, liver, spleen, and other organs can be identified; and the degree of retroperitoneal bleeding can be assessed by the size and dimensions of the retroperitoneal hematoma. Lack of uptake of contrast material in the parenchyma suggests arterial injury. The added anatomic detail for diagnosis of renal contrast extravasation and parenchymal/vascular injuries has translated into improved confidence in our ability to nonoperatively manage major injuries.

Spiral CT study should include immediate & 10 minutes delayed images for detecting parenchymal lacerations and urinary extravasation. CT findings of major injury are (1) medial hematoma suggesting vascular injury (2) medial urinary extravasation suggesting renal pelvis/ureteropelvic junction avulsion injury and (3) lack of contrast enhancement of the parenchyma suggesting arterial injury.

"Single-shot" Intraoperative Excretory Urography[5]: when the surgeon encounters an unexpected retroperitoneal hematoma surrounding a kidney during abdominal exploration. Only a single film is taken 10 minutes after iv injection of 2 ml/kg of contrast. If findings are not normal, the kidney should be explored for staging and reconstruction.

Arteriography is used to define and localize arterial injuries and angio-embolization.

Sonography/ Doppler is the screening study –it confirms the presence of two kidneys and can easily define any retroperitoneal hematoma. However it cannot clearly delineate parenchymal lacerations and vascular or collecting system injuries and cannot accurately detect urinary extravasation.

Classification

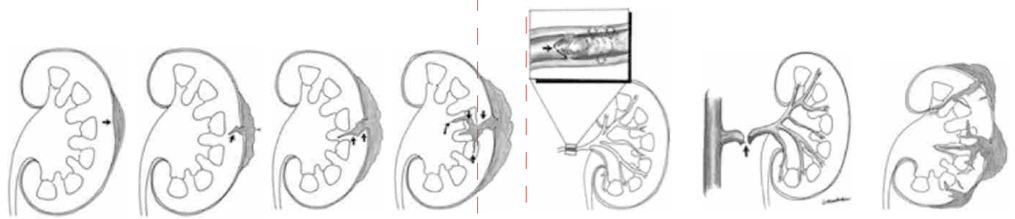
(American Association for the Surgery of Trauma's Organ Injury Scaling Committee[2])
On the basis of accurate grading made possible by contrast-enhanced computed tomography (CT), the AAST injury severity scale is a powerful and valid predictive tool for clinical outcomes in patients with renal trauma.

Table-American Association for the Surgery of Trauma Organ Injury Severity Scale for the kidney

GRADE	TYPE	DESCRIPTION
I	Contusion	Microscopic or gross hematuria, urologic studies normal
	Hematoma	Subcapsular, nonexpanding without parenchymal laceration
II	Hematoma	Nonexpanding perirenal hematoma confined to renal retroperitoneum
	Laceration	<1 cm parenchymal depth of renal cortex without urinary extravasation
III	Laceration	>1 cm parenchymal depth of renal cortex without collecting system rupture or urinary extravasation
IV	Laceration	Parenchymal laceration extending through renal cortex, medulla, and collecting system
	Vascular	Main renal artery or vein injury with contained hemorrhage
V	Laceration	Completely shattered kidney
	Vascular	Avulsion of renal hilum, devascularizing the kidney

Data from Moore EE, Shackford SR, Pachter HL, et al. Organ injury scaling: spleen, liver, and kidney. J Trauma 1989;29:1664–6.

* **Advance one grade for bilateral injuries up to grade III.**



Grades I through III can be clearly established on imaging.

Grades IV injuries -a laceration extends through the parenchyma into the collecting system. Vascular injury includes renal artery thrombosis, renal vein injury with contained hemorrhage. Grade V parenchymal injuries are referred to as *shattered kidney,* suggesting multiple grade IV–type lacerations, or renal pedicle avulsion **Nonoperative Management Significant injuries (grades II through V) are found in only 5.4% of renal trauma cases[6].** Nonoperative management has become the standard of care in hemodynamically stable, well-staged patients with American Association for the Surgery of Trauma (AAST) grade I to III renal injuries, regardless of mechanism[7]**.** Most of Grade IV and V blunt injuries can also be managed without renal operation if they are carefully staged and selected in otherwise hemodynamically stable patients[7].

Overall 98% of renal injuries can be managed nonoperatively. 50% of renal stab wounds and 25% of gunshot wounds can be managed nonoperatively in carefully selected patients with well-staged injuries.

All patients with high-grade injuries (grades III to V) selected for nonoperative management should be closely observed with serial hematocrit readings. Strict bedrest is mandatory until gross hematuria resolves. Patients presenting with urinary extravasation or nonviable parenchyma may be considered for periodic inpatient imaging, although the authors are aware of no studies to prove it helps in the absence of worrisome symptoms (fever, flank pain, dropping hematocrit). Although most grades II to IV injuries resolve uneventfully, delayed renal bleeding can occur in up to 25%[8]. Should bleeding

persist or delayed bleeding occur, angiography with selective embolization of bleeding vessels can obviate surgical intervention.

Operative Management Absolute indications include persistent renal bleeding, expanding perirenal hematoma, and pulsatile perirenal hematoma.

Relative indications include urinary extravasation, nonviable tissue greater than 20% in association with parenchymal laceration and/or urinary extravasation and incomplete staging. Very often, a combination of relative indications necessitates renal exploration.

Renal ExplorationSurgical exploration is best done via a trans-abdominal approach, which allows complete inspection of intra-abdominal organs. Injuries to the great vessels, liver, spleen, pancreas, and bowel can be stabilized, if necessary, before renal exploration. The renal vessels are isolated before Gerota's fascia is opened. **Renal Reconstruction**The procedure for renal reconstruction after trauma includes complete renal exposure, débridement of nonviable tissue, hemostasis by individual suture ligation of bleeding vessels, watertight closure of the collecting system, and coverage or approximation of the parenchymal defect. Renorrhaphy, partial nephrectomy, Vascular repair can be done.

Indications for Nephrectomy : Nephrectomy is indicated in extensive renal injuries when the patient's life would be threatened by attempted renal repair in an unstable patient, with low body temperature and poor coagulation if normal contralateral kidney is present. Damage control by packing the wound to control bleeding and attempting to correct metabolic and coagulation abnormalities, with a plan to return for corrective surgery within 24 hours is an option. Three-fourth nephrectomies are required because of the extent of parenchymal, vascular or combined injury and one-fourth because of hemodynamic instability.

ComplicationsDelayed renal bleeding can occur several weeks after injury, but it usually occurs within 21 days. Initial management is bed rest and hydration. Should the bleeding persist, angio-embolization can be done.

Persistent urinary extravasation can result in urinoma, perinephric infection, and even renal loss In a high percentage, the extravasation resolves spontaneously. Should it persist, placement of an internal ureteral stent often corrects the problem.

Perinephric abscess rarely occurs after renal injury, persistent urinary extravasation and urinoma are the typical precursors. Percutaneous drainage offers a good initial method of management, followed by surgical drainage if necessary.

Hypertension is seldom noted in the early postinjury period The basic mechanisms for arterial hypertension following renal trauma are (1) renal vascular injury, leading to stenosis or occlusion of the main renal artery or one of its branches (Goldblatt kidney); (2) compression of the renal parenchyma with extravasated blood or urine (Page kidney); and (3) post-trauma arteriovenous fistula. In these instances, the renin-angiotensin axis is stimulated by partial renal ischemia, resulting in hypertension

Key Points: Renal Trauma

The procedure for renal reconstruction after trauma includes complete renal exposure, débridement of nonviable tissue, hemostasis by individual suture ligation of bleeding vessels, watertight closure of the collecting system, and coverage or approximation of the parenchymal defect. Renorrhaphy, partial nephrectomy, Vascular repair can be done.

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Key Points: Renal Trauma

Expectant management strategies of renal trauma allow for maximal renal preservation

The degree of hematuria and the severity of renal injury do not consistently correlate Contrast-enhanced computed tomography (CT) is the gold standard for genitourinary imaging in renal trauma. Hemodynamically stable, well-staged renal injuries should be conservatively managed (even with severe, high-grade injuries).

Selective embolization provides an effective and minimally invasive means to stop active bleeding from parenchymal lacerations and segmental arterial injury.

CT findings suspicious for major injury include (1) medial hematoma (vascular injury); (2) medial urinary extravasation (renal pelvis or ureteropelvic junction injury); and (3) lack of contrast enhancement of the parenchyma (arterial injury). Intraoperative “one-shot” IVP confirms the presence of a contralateral functioning kidney.

Early vascular control before opening Gerota fascia can decrease renal loss.

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Expectant management strategies of renal .

AWARENESS OF CARDIOPULMONARY RESUSCITATION AMONG MEDICOS – AN OBSERVATIONAL STUDY.

Rakesh Garg[1], Rakesh Kumar[2], Sunil Kumar[3], Anil Misra[4], Nishkarsh Gupta[5]

Abstract

Objective: The most important determinant of survival from sudden cardiac arrest is the presence of a trained rescuer who is ready, willing, able, and equipped to act to provide resuscitation.
Aims: The aim of present study is to the assess awareness about CPR among medicos, to compare the awareness about CPR among anesthesiologist and non-anesthesiologists, and to assess the changing awareness about CPR among medicos with increasing medical experience.

Settings and Design: Prospective observational Study.

Place and duration of study: The medicos from various Hospitals of New Delhi over a period of one year in 2008.

Methods: The study was performed at various hospitals of Delhi. Both the government institutional and private hospitals were included. The data were collected by means of printed questionnaire, prospectively from all participants personally at clinics, wards, during lectures, conferences and libraries. The data were collected by means of printed questionnaire, prospectively from all participants.

Results: A 1440 of 1566 proformas were used for analysis as rest of the questionnaire proforma were not completed filled. Anaesthesiologists were better aware of CPR guideliens as compared to non anaesthesiologists clinical stream doctors. The paraclinical medicos were least aware of the CPR.

Conclusions: We observe from our audit that the anesthesiologists were more aware of correct CPR techniques as compared to non-anesthesiologist and medicos working in clinical field were more aware than those from non clinical fields. By virtue of their expertise in airway management and clinical resuscitation, anesthesiologists can significantly contribute to the teaching of CPR in the undergraduate medical curriculum. Training in Cardiopulmonary resuscitation (CPR) worldwide is predominantly carried out by a resuscitation council. Anesthesiologists are in the forefront of cardiac arrest teams and adequate knowledge and skills make them confident and competent in their ability to manage patients in cardiac arrest.

Key-words: Cardiopulmonary resuscitation, awareness, audit, anaesthesiologists.

Key Messages

By virtue of their expertise in airway management and clinical resuscitation, anesthesiologists can significantly contribute to the teaching of CPR in the undergraduate medical curriculum. Anesthesiologists are in the forefront of cardiac arrest teams and adequate knowledge and skills make them confident

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and competent in their ability to manage patients in cardiac arrest.

Introduction

Sudden cardiac death is emerging as biggest killer in the modern era. Most victims of sudden cardiac arrest demonstrate ventricular fibrillation at some point in their arrest. Timely cardiopulmonary resuscitation (CPR) along with defibrillation gives a better outcome in patient survival. Early bystander CPR can double or triple the victim's chance of survival thus necessitating not only the medicos but also lay persons to be well versed with the basic life support techniques. The most important determinant of survival from sudden cardiac arrest is the presence of a trained rescuer who is ready, willing, able, and equipped to act. CPR decisions are often made in seconds by rescuers not giving sufficient time to refer to literature or colleagues especially at a remote place. Though emergency services are available at most places, but still, it is expected at least from medical professional to start with basic life support in efficient methods based on latest recommendations.

A clinical audit is defined a quality improvement process that seeks to improve patient care and outcomes through systemic review of care against explicit criteria and the implementation of change. The structure, process and outcomes of care are selected and systemically evaluated against explicit criteria. When indicated changes are implemented at an individual, team or senior level and further monitoring is used to confirm improvement in health delivery.

The aim of present study is to the assess awareness about CPR among medicos, to compare the awareness about CPR among anesthesiologist and non-anesthesiologists (clinical, paraclinical, preclinical professionals), and to assess the changing awareness about CPR among medicos with increasing medical experience.

Subjects and Methods

The study was performed at various hospitals of Delhi. Both the government institutional and private hospitals were included. The data were collected by means of printed questionnaire based on American heart Association guidelines 2005, prospectively from all participants personally at clinics, wards, during lectures, conferences and libraries. The questionnaire was given and collected personally and participants were requested not to consult books / journals for filling of questionnaire. A database was prepared and analyzed by us.

Results

A total of 1566 medico were distributed questionnaire in the study. 1440 were used for analysis as rest of the questionnaire proforma were not completed filled and so were excluded from the audit. Of these 316 were final year MBBS students, 119 were interns, 96 were non academic junior residents, 460 were postgraduate students, 277 were senior residents, 172 were consultants. Among residents 39.8% were anesthesiologists, 32.3% were non-anesthesiologist clinical stream residents and 28% were non clinical stream (preclinical and paraclinical streams) residents
The questionnaires along with various answers obtained are presented below along with the pertinent observations.

1. You have been talking with a 60 year old man. He is alert and has been conversing normally. All at once he complains of a sudden weakness on one side of his face and in one arm. He is also having trouble speaking. What is the most likely cause of his problem?

a) A seizure
b) A heart attack
c) A stroke
d) Diabetic coma
e) Not sure of the problem

77.65% were in favor of a diagnosis of stroke while 9.9% were not sure of the diagnosis. Eight % mentioned it as heart attack. 90% each among anesthesiologist residents and non-anesthesiologist residents marked correct diagnosis as against to 56% among non-clinical residents.

2. At your workplace, an overweight office clerk begins to complain of sudden, severe “crushing” pain under his breastbone, in the center of his chest. The pain has lasted more than 5 minutes. What problem should you think, and what should you do?

a) Heartburn; tell him to take an antacid
b) Angina; call his family physician
c) Heart attack; call for help to emergency
d) Arrhythmia; drive him to an emergency department
e) Not sure of the problem

51.1% diagnosed this problem as heart attack and will call for help. 29.8% feels it as angina and will call family physician. About 9.6% were not sure of the diagnosis. 58.4% of anesthesiologist residents made a diagnosis of heart attack and called emergency for help as against to 60% among non-anesthesiologist clinical residents and 49% among non-clinical residents.

3. What is your first response when you see the collapsed adult victim on roadside?

a) Check for responsiveness
b) Call for ambulance
c) Start chest compression
d) Not sure

69.5% will check for responsiveness, while 16.5% will prefer to call for ambulance. 8.75% will start with chest compression. 86.7% of anesthesiologist residents checked for responsiveness as a first response to collapsed victim as against to 76% of non-anesthesiologist clinical residents and 49% among non-clinical residents.

4. Which of the following most accurately characterizes when you should start chest compressions?

a) As soon as you find that there is no circulation
b) After you have reassessed the victim's breathing
c) After giving the 2 initial ventilations
d) Whenever you find an unresponsive person
e) Not sure

29.9% will start chest compression as soon as they find that there is no circulation. 24.5% after reassessing breathing, 29.4% after giving the 2 initial ventilations, while 11.3% are not sure when to start chest compression. 38.8% anesthesiologists residents starts chest compression after checking for circulation as against to 35.7% among non-anesthesiologist clinical residents and 21.3% non clinical residents.

5. How will you open the airway of an unresponsive victim?

a) Head tilt- chin lift
b) Head extension
c) Open the mouth manually
d) Pull the tongue forward
e) Not sure

66.8% prefer head tilt chin lift for opening the airway in an unresponsive victim. 10.9% will perform head extension, 11.6% were not sure of how to open the airway. 90.1% anesthesiologist residents opened the airway by head tilt and chin lift as against to 72.3% non-anesthesiologist clinical residents and 41.8% non clinical residents.

6. How will you check breathing in an unresponsive victim?

a) Look, listen and feel for breath
b) Observe for chest movement
c) Auscultate for breath sounds
d) Checking pupils
e) Not sure

53.4% will check breathing by look listen and feel, while 22.6% will observe for chest movement, 13.96% will auscultate for breath sounds and 8.33% were not sure of problem. 87.4% anesthesiologist residents checked breathing by look listen feel for breath as against to 55.5% non-anesthesiologist clinical residents and only 24.3% non clinical residents.

7. How many rescue breaths should be given to an unresponsive patient who is not breathing?
a) 1
b) 2
c) 3
d) 4
e) Not sure

47.4% will give 2 rescue breaths, 10% will give 3, 8.4% will give 4, and 30 % were not sure of number of rescue breaths to be given to an unresponsive patient who is not breathing. 88.4 % anesthesiologist residents provided 2 rescue breaths as against to 45.4% non-anesthesiologist clinical residents and 24.3% non clinical residents.

8. How do you assess effective rescue breath?
a) Visible chest rise
b) Chest rise and little more
c) Auscultate at five points
d) Measure tidal volume
e) Not sure

59.5% assess effective rescue breath by visible chest rise, 16.1% by chest rise and little more while 13.3% were not sure about how to assess effectiveness of rescue breath. 80.5% anesthesiologist residents assessed effective rescue breath by visible chest rise as against to 72.7% non-anesthesiologist clinical residents and 40% non clinical residents

9. How will you assess circulation in an unresponsive victim?
a) Auscultate heart sounds
b) Check carotid pulse
c) Check radial pulse
d) See for signs of circulation (coughing, breathing, movement)
e) Not sure

Though 62.8% medicos preferred carotid pulse for assessing circulation, but 16.4% checked radial pulse and 10.5% will auscultate heart sounds for assessing circulation. 76.5% anesthesiologist residents checked the carotid pulse for assessing circulation as against to 75.6% non-anesthesiologist clinical residents and only 46.1% non clinical residents.

10. What is compression to ventilation ratio in adults, for a *lone* rescuer?
a) 30:2
b) 15:2
c) 15:1
d) 5:1
e) Not sure

Only 27.6% medicos provides a 30:2 ratio, while 38.4% favors 15:2, and 13% were not sure of the ratio of compression to ventilation. 58.7% anesthesiologist residents provide a compression to ventilation ratio of 30:2 as against to 16.5% among non-anesthesiologist clinical residents and 13.9% non clinical residents.

11. What is correct *rate or speed* to perform chest compressions for an adult victim of cardiac arrest?
a) 100 compressions per minute
b) 80 compressions per minute
c) 60 compressions per minute
d) Varies with the condition of patient
e) Not sure

41% preferred (a), 21% were in favor of (b), 21.3% were in favor of (c) while 13.3% were not sure of compression rate.82.9% anesthesiologist residents chooses a compression rate of 100 per minute as against to 39.5% non-anesthesiologist clinical resident and 19.4% non clinical residents

12. How many shocks for defibrillation to be given in cardiac arrest patients with Ventricular Fibrillation?
a) 3 stacked shock
b) 1 shock
c) 2 stacked shock
d) Not sure

31.1% will give 3 stacked shock, 22.4% preferred one shock while 31.2% were not sure of the number of shocks to be given. 45.4% anesthesiologist residents preferred 1 shock as against to 14.7% non-anesthesiologist clinical residents and 19.9% non-clinical residents.

13. What is the amount of energy to be given for defibrillation (monophasic)?
a) 360 Joules
b) 200 joules
c) 300 joules
d) Not sure

360 J is preferred by 43.3%, 20% will give 200 J while 27.5% were not sure of amount of energy to be given for defibrillation. 60.4% anesthesiologist residents chose to give 360 J as against to 49.6% non-anesthesiologist clinical residents and 31.6% non-clinical residents

14. If you see a collapsed or trauma victim on roadside, whom will you contact first?
a) CATS
b) Police
c) Fire brigade
d) Relatives
e) None

Though 75.2% prefers to call CATS ambulance, 16.2% will infirm police and 6.1% will not respond if they see a collapsed or trauma victim on roadside. 94.5% anesthesiologist residents prefers to call CATS ambulance as against 82.8% non-anesthesiologist clinical residents and 59.7% non clinical residents

15. Which of the following are the shockable rhythms?
a) Ventricular Fibrillation and Pulseless Ventricular Tachycardia
b) Ventricular Fibrillation and Pulseless Electrical Activity
c) Ventricular Fibrillation and Asystole
d) Asystole and Pulseless Electrical Activity
e) Asystole and Pulseless Ventricular Tachycardia
f) Not sure

45.6% marked (a), 7.43% marked (b), 11.7% marked (c), 7.6% marked (d), 4.7 % marked (e) and 22.9% were not sure. 77.8% anesthesiologist residents recognized the correct shockable rhythm as against to 58.8% non-anesthesiologist clinical residents and 22.8% non clinical residents.

16. Which of the following adjuncts for airway control you have seen and used? (please tick)

	Seen only	Used
a) Resuscitator (AMBU) bag and mask	( )	( )
b) Oropharyngeal airway (OPA)	( )	( )
c) Nasopharyngeal airway (NPA)	( )	( )
d) Esophageal tracheal Combitube	( )	( )
e) Laryngeal Mask Airway (LMA)	( )	( )
f) Laryngoscopy and endotracheal intubation	( )	( )
g) Pocket face mask	( )	( )

89.9% has seen resuscitator bag but only 54.6% has actually used them. 81.2% has seen OPA and 47.2% have used them. 70.7% has seen NPA and 33.8% has used it. 22.5% has seen combitube and 9.3% has used it. 50% has seen LMA and 19.8% has used it. 84.7% has seen laryngoscopy and intubation but only 47.4% has actually performed it. 23.8% has seen pocket mask but only 9.72% has used it in clinical scenario.

72.7% anesthesiologist residents have used all above airway adjuncts as compared to only 36.5% non-anesthesiologist clinical residents and 20% non-clinical residents.

17. What is the dose of Epinephrine in cardiac arrest patients and how frequently it is to be repeated?
a) 1mg ; every 3-5 minutes
b) 1mg ; every 1 minutes
c) 3mg ; every 3-5 minutes

d) 3mg ; every 1 minutes
e) Not sure

Only 56% preferred to administer 1 mg every 3-5 minutes. 22.6% were not sure of the dose and frequency of repetition. 86.4% anesthesiologist residents chose the correct dose and duration in contrast to 66% non-anesthesiologist clinical residents and 41.3% non clinical residents.

18. What is the full form of AED?
a) Atrial electricity detector
b) Arrhythmia eliminating device
c) Automated external defibrillator
d) Arrhythmia eliminating defibrillator
e) Not sure

44.6% were aware of Automated external defibrillator while 47% were not sure of it. 87.4% Anesthesiologist residents were aware of full form of AED in contrast to 24% non-anesthesiologist clinical residents and 25% non clinical residents.

19. What is the preferred site for a pulse check in an adult unresponsive victim?
a) At the radial artery
b) At the brachial artery
c) At the carotid artery
d) At the precordium
e) Not sure

71.9% preferred carotid pulse while 15.3% preferred radial pulse and 7.9% were not sure of the preferred site of pulse check. 89.8% anesthesiologist residents preferred carotid artery for pulse check as against to 81.9% non anesthesiologist clinical residents and 56.3% non clinical residents.

20. Have you seen and used Defibrillator?
a) Yes
b) No
Only 45.1% have seen and used defibrillator. 76.5% anesthesiologist residents have seen and used defibrillator while only 63.4% non anesthesiologist clinical residents and 18.9% non clinical residents had done so.

21. What is the depth of chest compression in adults?
a) 1.5 – 2 inches
b) 0.5 - 1 inches
c) No specific depth, compress as much possible
d) Not sure

58.2% preferred compressing 1.5 – 2 inches. 18.6% compressed 0.5 - 1 inches. 18.6% were not sure of the compression depth. 89.4% anesthesiologist residents chose the correct compression depth while only 78% of non anesthesiologist clinical residents and 34.5% non clinical residents were aware of correct depth.

22. What is the position of rescuer hands during chest compression?
a) Over the sternum between the nipples
b) Over the xiphisternum
c) Over manubrium sterni
d) 2 finger breadth above xiphisternum
e) Not sure

44.3% marked (d), 28.4% marked (a), 11.9 % marked (e), 9.2 % marked (b) and 6.2% marked (c). 46.88% anesthesiologist residents positioned their hands correctly as against to 29.35 non anesthesiologist clinical residents and 27% non clinical residents.

23. What is the contact number of
a) Ambulance -- _____
b) CATS --_____
Only 40% and 24.4% medicos were aware of ambulance and CATS contact number respectively. 51.25 and 36.8% of anesthesiologist residents were aware of correct ambulance and CATS number respectively as against to 34.5% and 24.3% non anesthesiologist clinical residents and 38.4% and 26.25 non clinical residents respectively.

24. Have you received any formal training in CPR? (Please tick)
a) Yes
b) No
33.6% have received training in CPR. 56.6% anesthesiologist residents have received formal training in CPR as against to 38.2% of non anesthesiologist clinical residents and 18.9% of non clinical residents.

25. If yes, has training been given by –
a) International agency
b) National agency
c) College
d) Department
Of all the medicos 26.6% have received information of CPR at college and department level. 6.9% have received training from CPR trained instructors.

Discussion

Evidence based recommendations of resuscitation are published by various resuscitation councils. Medicos are supposed to be aware of the latest recommendations that are based on various evidences, randomized controlled trials, and meta-analysis. The present study questionnaire was based on resuscitation guidelines published by American Heart Association in 2005. The latest version of CPR 2010 recommendations by various resuscitation councils is aimed at to simplify CPR instructions. The present study was aimed to bring about the awareness of CPR in the medicos. This understanding is expected to bring about better resuscitation outcomes.

We observe from our audit that the anesthesiologists were more aware of correct CPR techniques as compared to non-anesthesiologist and medicos working in clinical field were more aware than those from non clinical fields. It has been observed that the medicos involved in providing emergency care and resuscitation fare well in providing resuscitation better than the medicos involved less frequently in such care.[1] The postgraduates students especially in the clinical streams scored maximum correct CPR questionnaire in our audit. This probably may be attributed to the academic curriculum and performing the CPR in their clinical practice.

Among the residents, the knowledge improved gradually from 1st year postgraduates to final year postgraduates. A decline in the awareness was noted among senior residents from 1st senior residency to final year senior residency. It has been observed that the skill declines over a period of time and may even reach to a level of untrained if regular practice is not maintained.[2,3,4] This fact was also observed in our study as well. The residents routinely involved in CPR retained facts better than the counterparts who were not involved in CPR directly. Though many of the medicos were aware of CPR, but the knowledge was that of older recommendations rather than the changed recent recommendations of resuscitation councils. This reiterates repeated training like refresher courses at regular intervals or mock practices to retain the knowledge of the CPR.

The American governement has designated the first week of June "National Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillator (AED) Awareness Week" and to be managed by American Red Cross and the American Heart Association.

We have to develop some national resuscitation council and programme and groups that undertake to create awareness about heart disease and stroke and develop programs to reduce death and disability from these conditions in the workplace. The need of detecting Acute MI has also been reiterated earlier so that early CPR and AED can be brought in use early.[5] Activities should include development of training and education materials and programs about CPR/AED. The CPR awareness should not be restricted to anesthesiologist but should be spreaded not only to medicos but steps should be taken to spread further down to paramedics and layperson. Video self-instruction has been shown to improve competence in resuscitation.[3] In a survey in junior doctors it was found that inappropriate CPR resulted from the failure of seniors to ascertain CPR status. It was statistically proven that six-monthly training/ updates are associated with less stress and increased confidence.[4]

The need of knowing emergency telephone number needs to be emphasized.[6]

The limitation of the present audit is that awareness of CPR was based on questionnaire only and may differ in real time scenario of performing CPR. Also the questionair may change due to revised guidelines of CPR in 2010. Though our audit was performed at Delhi and NCR only, but the participants of the audit belonged to various states and studied in different medical colleges and hospitals of India.

By virtue of their expertise in airway management and clinical resuscitation, anesthesiologists can significantly contribute to the teaching of CPR in the undergraduate medical curriculum. Training in Cardiopulmonary resuscitation (CPR) worldwide is predominantly carried out by a resuscitation council. Anesthesiologists are in the forefront of cardiac arrest teams and adequate knowledge and skills make them confident and competent in their ability to manage patients in cardiac arrest.

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ROLE OF METOPROLOL ON STRESS RESPONSE OF LARYNGOSCOPY, INTUBATION AND CO_2 PNEUMOPERITONEUM IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

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SUMMARY

In this study, we tried to evaluate the role of metoprolol in blunting the stress response of laryngoscopy, intubation and CO_2 pneumoperitoneum. In a prospective randomized trial, 60 adult patients, scheduled for laparoscopy cholecystectomy were randomly allocated to one of the two groups. Group 1 received 3ml (3mg) of metoprolol intravenously and group 2 received 3 ml of normal saline as placebo before induction. Laryngoscopy and intubation was done after 5 min of test drug or placebo. Haemodynamic parameters including heart rate, systolic blood pressure and diastolic blood pressure were recorded at intubation; 3, 5, 10, 15 min after intubation; then every 15 min throughout procedure; at pneumoperitoneum; at trochar insertion; off pneumoperitoneum and after extubation and analyzed. There is significant reduction in heart rate, systolic and diastolic blood pressure in group1 as compared to group 2 after 1, 3and 5 minutes of intubation as well as throughout the laparoscopy procedure.

We concluded that single bolus dose of metoprolol is effective in blunting the circulatory response to laryngoscopy, intubation and offers better haemodynamic stability during CO_2 pneumoperitoneum during laparoscopic cholecystectomy.

INTRODUCTION

Laryngoscopy, intubation and carbon dioxide insufflations causes a marked increase in heart rate and blood pressure.[1-3] Arrhythmias can also occur causing haemodynamic instability in patients with cardiovascular diseases. This pattern is because of increase in adrenergic activity due to great stress response during laryngoscopy and intubation. During carbon dioxide pneumoperitoneum, it may be due to increase in abdominal pressure, neurohumoral response and absorbed CO_2.[4-5]

A and β receptor blockers suppress these responses by decreasing the outflow of sympathetic neuronal pathway, inhibiting cortisol release and hepatic glycogenolysis.

Metoprolol tartarate, a β-adrenegic receptor blocking agent. It has a preferential effect on β adrenoreceptors, chiefly located in cardiac muscle. The selectivity of metoprolol may decrease adverse effects attributed to non-selective β antagonists.

A prospective randomized, double blind study was conducted to evaluate the influence of metoprolol in attenuating circulatory response after airway manipulation and CO_2 pneumoperitoneum.

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MATERIAL AND METHODS

With institutional review board approval and written informed consent, 60 normotensive patients (ASA grade I and II), in age group of 20-60 years undergoing laproscopic cholecystectomy were included in this study. Exclusion criteria was patients wirh hypertension, ischaemic heart disease, heart block, pulmonary, hepatic, renal disease and patients who may require more than one attempt of intubation.

All patients were premedicated with alprazolam 0.5 mg night before surgery. The patients were randomly divided in two groups of 30 each. The patients of group I received 3 ml (3 mg) of Inj. Metoprolol and group II received 3 ml of normal saline as placebo.

General anaesthesia was then induced with Inj.morphine (0.1 mg/Kg), thiopentone (5 mg/Kg) and vecuranium (0.1 mg /Kg). Patients were ventilated with a face mask using nitrous oxide in oxygen (1:1). At the end of 4 minutes laryngoscopy was done using Macintosh laryngoscope and atraumatic tracheal intubation done within 30 seconds. Anaesthesia was maintained with Isoflurane (1.5-2%), nitrous oxide, oxygen and vecuranium. At the end of operation the residual effect of relaxant was reversed with neostigmine and glycopyrollate.

Cardiovascular parameters recorded were heart rate, systolic blood pressure, diastolic blood pressure as per following schedule;
1) Baseline value (in operation theatre)
2) After test drug or placebo
3) At intubation
4) 3, 5, 10, 15 min after intubation; and then every 15 min throughout procedure
5) At pneumoperitoneum
6) At trochar insertion
7) Off pneumoperitoneum
8) After extubation.

All values of heart rate, systolic and diastolic B.P. were analysed by independent t test.

RESULTS

The characteristics of patients and duration of anaesthesia and surgery were similar in both groups (table1 and 2).

Table 1: Age, weight and gender distribution

	Group 1	Group 2
Age (years) Mean±S.D	20-65 35.83±11.21	22-60 36.53±8.56
Weight Mean±S.D	35-90 51.23±12.77	42-70 56.53±7.63
M:F Ratio	3:27	2:28

Table 2: Duration of Anaesthesia and Surgery

	Group 1	Group 2
Duration of Anaesthesia (min)	92.93±20.15	68.68±19.10
Duration of Surgery (min)	101.69±21.10	81.41±24.05

The heart rate, systolic and diastolic blood pressure after metoprolol or placebo (group1 and 2 respectively) are shown in table3, 4 and 5. There is significant reduction in heart rate, systolic and diastolic blood pressure in group1 as compared to group 2 after 1, 3and 5 minutes of intubation as well as throughout the laproscopy procedure. Heart rates were significantly higher at 5, 10 and 15 minutes after intubation in group 2. Systolic blood pressures were significantly higher in group 2 at 3 and 5 minute after intubation. Heart rate and systolic blood pressure were significantly higher in control group after pneumoperitoneum also.

Table 3: Comparison of heart rate in two groups

Study Group	Group 1	Group 2	Significance
Baseline	91.71±11.55	87.07±9.18	p >0.05
After test drug	88.93±11.35	87.93±11.94	p >0.05
At intubation	99.57±5.70	95.31±7.42	p >0.05
3 min	83.00±12.18	93.58±10.95	p >0.05
5 min	78.18±12.00	92.17±13.29	p<0.001
10 min	79.18±12,82	90.83±13.40	p<0.001
15 min	79.39±11.89	91.52±11.44	p<0.001
30 min	78.96±12.16	96.43±11.89	p >0.05
45 min	76.21±12.35	85.86±12.95	p >0.05
60 min	80.65±14.32	81.68±11.69	p >0.05
At pneumoperitoneum	80.46±13.12	96.72±15.91	p<0.001
At trochar insertion	79.36±14.02	87.66±12.81	p >0.05
Off pneumoperitoneum	79.14±12.50	84.41±11.94	p >0.05
Extubation	90.00±16.95	104.93±16.19	p >0.05

Table 4: Comparison of Systolic blood pressure in two groups

Study Group	Group 1	Group 2	Significance
Baseline	131.61±13.45	128.76±10.18	p >0.05
After test drug	118.57±21.79	119.72±13.74	p >0.05
At intubation	124.96±13.74	124.72±15.59	p >0.05
3 min	116.57±10.99	127.52±8.92	p<0.001
5 min	115.11±14.58	127.76±10.66	p<0.001
10 min	119.18±15.17	131.66±12.09	p >0.05
15 min	123.64±15.89	134.28±13.52	p >0.05
30 min	125.70±14.52	136.00±11.10	p >0.05
45 min	125.00±14.52	136.00±13.24	p >0.05
60 min	128.00±14.90	124.00±9.86	p >0.05
At pneumoperitoneum	115.33±13.87	120.62±15.38	p<0.001
At trochar insertion	118.68±15.5	130.17±12.36	p >0.05
Off pneumoperitoneum	123.18±15.18	125.96±10.94	p >0.05
Extubation	141.64±19.63	157.76±19.49	p >0.05

Table 5: Comparison of diastolic blood pressure in two groups

Study Group	Group 1	Group 2	Significance
Baseline	85.96±11.88	82.93±7.41	p >0.05
After test drug	77.00±13.83	87.66±9.57	p >0.05
At intubation	84.21±11.27	91.59±13.96	p >0.05
3 min	74.75±8.89	79.79±8.74	p >0.05
5 min	75.21±10.25	82.10±8.37	p >0.05

10 min	79.57±11.67	90.93±11.79	p<0.001
15 min	82.18±11.82	88.38±9.96	p >0.05
30 min	80.57±11.27	87.44±7.22	p >0.05
45 min	80.25±11.76	87.67±10.53	p >0.05
60 min	83.15±10.22	81/.08±8.27	p >0.05
At pneumoperitoneum	78.07±11.18	85.52±13.93	p<0.001
At trochar insertion	78.32±13.34	87.45±13.81	p >0.05
Off pneumoperitoneum	80.36±12.85	82.03±8.85	p >0.05
Extubation	90.75±12.71	88.83±12.81	p >0.05

DISCUSSION

Extensive research has been done with short and long acting β adrenergic blockers to attenuate circulatory response to laryngoscopyand intubation; decreasing the requirement of propofol and analgesics in peroperatve period; and decreased pain, nausea and vomiting in post operative period. Esmolol, as bolus and continous infusion, has been successfully used for blunting the circulatory response to laryngoscopy and intubaton;[6] decreased propofol, inhalational anaesthetic[7] and analgesic requirement; better haemodynamic stabillty;[8] decreased post operative pain ,nausea and vomiting [9] and hence decreased time to discharge home after ambulatory laproscopic surgery. [10-11]

Atenolol was studied by Michael Zaugg and et al and confirmed that atenolol decreased the analgesic requirement, had better haemodynamic stablilty and allows faster recovery from anaesthesia.[12]

Maharajan S k studied the role of IV Propranolol on haemodynamic response due to airway manipulation and CO_2 pneumoperitoneum and concluded that the propranolol effectively blunts the stress response to CO_2 pneumoperitoneum. However they said that there balanced anaesthesia technique was adequate to decrease the stress response to laryngoscopy and intubation.[13]

Efficacy of metoprolol in attenuating the circulatory response to laryngoscopy and tracheal intubation was evaluated by Mudit Kumar and A.C.Tikle. They concluded that a single bolus dose of intravenous metoprolol (3 mg) given5 minutes before induction of anaesthesia attenuates the cardiovascular response to a clinically significant level.[14]

Being long acting, we used metoprolol 3 mg intravenously for blunting the circulatory response to laryngoscopy and intubation as well as to have a better haemodynamic control in CO_2 pneumoperitoneum created for laproscopic cholecystectomy.We concluded that single bolus dose of metoprolol is effective in blunting the circulatory response to laryngoscopy , intubation and offers better haemodynamic stability during CO_2 pneumoperitoneum during laproscopic cholecystectomy.

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ANAESTHESIA FOR ROBOTIC ASSISTED THORACIC SURGERY - A REVIEW

Sabih Ahmad [1], Yatin Mehta[2]

Abstract

Robotic Assisted Thoracic Surgery (RATS) is one ofthe most recent advances in the thoracic surgery practiced especially in this part of the world i.e. Indian Subcontinent. We, hereby, present our review of 30 cases from June, 2011 to May 2012, done successfully in our hospital, Medanta The Medicity, Gurgaon, HR, India. We already head an ongoing successful Video Assisted thoracic Surgery(VATS) programme and our anaesthesia team had already been well versed Double Lumen Tube (DLT) placement, One Lung Ventilation (OLV) and Bronchoscopic skills.

Key words

Robotic Assisted Thoracic Surgery , Video Assisted Thoracic Surgery, Double Lumen Tube, One Lung Ventilation, Bronchoscopy

Introduction

RATS (Robotic Assisted Thoracic Surgery) is indeed the recent advancement in thoracic surgery Speciality that too in this part of the world i.e. Indian Subcontinent. We, at Medanta The Medicity, the newly established super speciality hospital, already had a successful VATS programme with a vast variety of thoracic surgical cases being done in numbers. Our anesthesia team has already been well versed with DLT placement, OLV and bronchoscopic skills and manipulations.

RATS program is bound to increase with the introduction of robotic system, particularly the da Vinci Robot System. RATS has shown excellent, limited, and definite advantages over VATS and open thoracic surgery. The learning curve of this new tool is very steep as we have observed in our hospital especially for the surgeon who is already well versed in VATS.

The Thoracic Surgery Department uses the da Vinci Surgical System to perform various thoracic procedures with minimally invasive robotic techniques. The robotic system provides binocular 3–D visualization and its four arms provide the surgeon accessibility and control to perform variety of minimally invasive thoracic surgical procedures with seven degrees of freedom in thoracic cavity. Established and documented benefits of this newly evolved techniques are shorter hospital stay, lesser blood loss & reduced need for blood transfusion, less pain, quick recovery, reduced infection & complication chances ,faster return to daily routine activities, decreased inflammation of body tissue and of course minimal scarring[1].

As the thoracic surgeon adopts this new tool and learns to master it, with its learning curve being very steep, anaesthesiologist should have a basic knowledge of this system to formulate an effective and safe anaesthetic plan with simultaneous

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recognition of the potential complications and thereby dedicating his efforts to provide a safe and effective patient care in coordination with the robotic thoracic surgeon and support staff.

Methods

In this study, retrospective review of all the cases, admitted for robotic thoracic surgery at our hospital from June 2001 to June 2012, was done. The hospital surgical registry was reviewed and all the thoracic surgery files were followed from the medical records department.

All the patients planned for robotic thoracic surgery, were given general anaesthesia as per standard anaesthetic technique. Induction with propofol, midazolam and fentanyl.Relaxed with vecuronium/ atracurium. Orotracheal intubationwas done with cuffed orotracheal double lumen tube (DLT) of the appropriate size. The position of the DLT is checked and confirmed with bronchoscopy and the desired lung isolation is checked. Maintained on - O2, air, Sevoflurane / isoflurane/ desflurane with atracurium and fentanyl infusions. One or two wide bore i.v. cannulas (16 or14 G) are additionally secured with long iv extension lines connected to slow iv infusions. Invasive BP monitoring was done by radial artery catheterization. OLV was provided after the positioning of the patient, at the start of the surgery, as per surgeon's need. Central lines are usually not needed, except in one case of pneumnectomy.

Monitoring is done with ECG, Spo2, IBP, ETCO2, MAC, fiO2, ABG, airway pressure, temp, urine output & rarely CVP. Elastic stockings and DVT pumps to both the legs are a routine. At the end of the surgery, paravertebral / intrapleural catheter was secured for post-operative analgesia by 0.25% bupivacaine @ 4 - 8 ml/hour. All the patients are extubated on table after reversal with neostigmine and glycopyrrolate. The average surgical time for most of the robotic procedures is about 3 to 5 hours. They were kept for 4 hours in the PACU and then shifted to the wards /rooms after removing the arterial line. Only one patient i.e. pneumnectomy was shifted to ICU, that too for monitoring after extubation on table.

Anaesthetic Consideration

Positioning: Positioning of the patient is very important in robotic thoracic surgery; the patient is positioned lateral in lobectomy and pneumonectomy with non-dependent lung being isolated, while the patient is supine with arm abducted at 90 degree in thymectomy, retrosternal goiter, mediastinal mass resection and ectopic parathyroid etc. Pressure points are padded with silicone gel pads and soft cotton padding to prevent potential nerve injury[2].

The accessibility of the patient is not easy for the anaesthetist as the patient's head end is away from the anaesthesia work station (i.e. 180 degrees), hence the need for long gas circuit and long i.v. lines secured to multiple wide bored cannulas. This situation calls for the need of two anaesthetists in the OT, one for the head end and the other for the anaesthesia work station end.

Chances of DLT placement mispositioning exist at the time of positioning, warranting the need for flexible bronchoscopy as and when required for DLT placement manipulation and lung isolation[3].

Docking of the robotic arms from the head end or from the side to the surgical ports made on thoracic surgical sites usually takes 15 – 40 minutes. Once docked, immediate undocking takes minimum of 60 – 90 seconds and further 30 - 40 seconds to make the patient supine, in case any emergency arises & the need for CPR and defibrillator, hence, all the emergency kits and devices should always be ready.

As the chances of converting the RATS to an open thoracotomy exist, all measures must be taken to manage the patient accordingly if the situation arises. Two wide bore i.v. lines with 14/16/18 G cannulas should always be secured beforehand and appropriate standby arrangement of PRBC and blood products etc. should be there as and when needed.

Dependent lung being ventilated with DLT with low tidal volume and higher respiratory rates after lung isolation to provide OLV, ABG assessment should be done regularly to judge the adequacy of then intraoperative ventilation and adjustment in ventilator parameters accordingly. Anaesthetist should be highly vigilant regarding monitoring of the vitals and the slave monitor meant for assistant surgeon as any event during RATS can easily be assessed and intervened before vitals deteriorating[4,5].

Intraoperative need for suctioning the nondependent lung, passive ventilation with oxygen flow catheter, sometimes need for intermittent double lung ventilation may be needed if oxygen saturation is not maintained adequately with the OLV[6,7].

Surgeon, assistant surgeon, anaesthetist and the patient all are quite far away from each other, so the need for a calm and quiet OR is a must during RATS because the communication between all the three persons which is usually meant for the patient lying on the OT table needs to be appreciated with high regards all the times.

RATS – Medanta Experience

Total cases	=	40
Lobectomy	=	16
Pneumonectomy	=	1
Thymectomy	=	9
Mediastinal mass resection	=	6
First rib resection	=	1
Retrosternal thyroid resection	=	1
Diaphragmatic plication	=	1
Ectopic parathyroid resection	=	1
Paravertebral mass resection	=	1
Ligation of thoracic duct	=	1
Fungal ball excision	=	1
Bronchogenic cyst excision	=	1

All patients were successfully extubated on table except one RATS – thymectomy, because of massive blood loss, shifted to ICU on VCV with DLT been converted to SLT. One patient of RATS – thymectomy had transient asystole due to accidental high inflow of CO2 insufflation used for lung deflation. The problem was instantly recognized, insufflation stopped, drugs i.v. atropine and ephedrine were used instantly to treat the condition. No defibrillator or shock was required. Even this patient was extubated successfully on table and shifted to ICU for monitoring purpose only for one day. Rest of the patients were kept in PACU for 2 – 4 hours and shifted to rooms after removing arterial lines. Need for PRBC transfusion (3units)was needed in one patient. Rests were uneventful. All the ABG parameters were maintained by ventilator maneuvers, no chemical agent was required for correction of blood gas derangements. ABG just before the time of extubation were within normal limits after adequate ventilator adjustment.

Discussion

As the robotic assisted thoracic surgery continues to evolve and grow at a faster pace because of its undoubted definitive advantages over the conventional methods. The anaesthesiologist should formulate an effective, safe and vigilant protocol for its anaesthetic consideration.

In our review of 40 cases of robotic assisted thoracic surgery cases in Medanta, we have observed that the learning curve of this new tool is very steep. Surgeon well versed in VATS learns this new technique very fast. Initial few cases took a relatively longer time for surgery but after 3 – 4 cases on robot, the duration of surgery done by robotic assistance was comparable with the conventional techniques. RATS is the future of the thoracic surgery in all the leading healthcare centres of India, once this cost factor regarding robotic system comes down.

Presently, enjoyed by the elite and the rich class, the technology has to reach the masses, when the cheaper versions of the robotic system reach the market at the competitive price. The concerned anaesthesiologist should be well aware about the robotic system and hence, the need for a safe

anaesthetic plan for RATS.

The anaesthesiologist should be well versed in DLT placement and bronchoscopic maneouvers. The patient's head being at 180 degree to the anaesthetist and the anaesthesia work station demands the need for an additional anaesthetist at the head end. Long i.v. lines via wide bore i.v. cannulas (preferably 2), long tubing of gas circuit, invasive BP (preferably non-dependent radial) are must. Extra vigilance of CO2 insufflation in thoracic cavity regarding flow, rate and pressure is needed, as any error can be catastrophic. The patient being on OLV most of the times should be ventilated with low tidal volumes and higher respiratory rates and intermittent ABGs as per ETCO2 monitoring.

Conclusion

Anaesthesia for robotic assisted thoracic surgery is challenging and dynamic. It presents specific concerns and complications requiring urgent interventions.

Prior experience with thoracic anaesthesia, double lung ventilation techniques is a mustbefore handling this new tool i.e. robotic assisted thoracic surgery and thereby, its anaesthetic considerations.Formulation of a safe and effective anaesthesia plan with monitoring ofvitals and haemodynamics, airway pressures, ABG and good vigilance is the key to a safe anaesthesia protocol for robotic assisted thoracic surgery.

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CRITICAL CARE OF THE PATIENT WITH DUCHENNE MUSCULAR DYSTROPHY: A CASE REPORT

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Abstract

Duchenne muscular dystrophy (DMD) is the most common form of muscle dystrophy. It is characterized by progressive deterioration of muscle strength, loss of ambulation, and severe respiratory dysfunction. Despite modern advances in gene therapy and molecular biology, DMD has no cure. With proper care and attention, patients may have a better quality of life but most still die in the third decade of life. Patients usually end up in critical care unit due to cardio-respiratory insufficiency. The mainstay of therapy in critically ill patients of DMD remains assisted ventilation, nutritional support and effective mucous clearance. There are certain concerns which need special attention by the critical care providers such as anomalous airway anatomy, choking and aspiration, nocturnal hypoventilation and frequent chest infections. Here we discuss the critical care and management strategies of a 19 year old boy having DMD with severe thoracolumbar scoliosis who was treated in the intensive care unit (ICU) of our institution.

Key Words: Duchenne muscular dystrophy (DMD), ventilation, nutritional support, tracheostomy tube, adjustable flange

Introduction

Duchenne-type muscular dystrophy (DMD) is a disease characterized by progressive loss of muscle strength, resulting in loss of ambulation, loss of respiratory muscle strength, and eventually leading to mortality from respiratory failure. Most of these patients develop respiratory insufficiency and cardiomyopathy, and mortality usually occurs in the third decade of life [1]. However the care of patients with DMD has evolved significantly in the last decade resulting in an unprecedented quality of care and duration of survival. Some of the most noticeable advances in the multidisciplinary care of these patients include assisted ventilation (invasive or non-invasive), mucous clearance and nutrition therapy. However, with prolongation of survival attributed to advanced critical care resources has resulted in complex psychosocial and ethical issues amongst the patient family.

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We discuss the critical care management of a young boy suffering from DMD with associated severe thoracolumbar scoliosis in the intensive care unit (ICU) of our institution.

Case History

A 19 year old boy with a diagnosis of DMD was brought to our emergency room (ER) with complaints of high grade fever, constipation and severe productive cough. On examination, we found that he had severe scoliosis in thoracolumbar region. The patient was dyspneic and disoriented. He soon had a respiratory arrest and was immediately resuscitated. After initial resuscitation he was directly shifted to our intensive care unit (ICU) for ventilatory support and further management.

Arterial blood gas analysis (ABG) analysis was sent which showed severe hypoxemia with metabolic acidosis. Immediately the ionotropic support (dopamine @10µgm/kg/min and horadrenalin @0.15µgm/kg/min) was started in view of the hemodynamic instability. Baseline investigations were done which showed hemoglobin (Hb)-9.0g/dl, total leukocyte count (TLC) - 18,200/Ul, differential leucocytes count (DLC)-neutrophills 90%, lymphocytes 10%. Empirical broad spectrum antibiotics (piperacillin/tazobactum 4.5 gm q 6 hours with amikacin 7.5 mg/kg q 12 hours) were started after sending the cultures form blood and tracheal aspirate. Ultrasound guided central venous pressure (CVP) line was inserted in right subclavian vein via supraclavicular approach.CVP guided fluids were started to keep the pressure above 15 mmHg. On day 3 in ICU, he showed significant improvement in chest condition. His cultures revealed klebsiella pneumonia sensitive to the empirical antibiotics which were continued thereafter. Chest X ray (AP view) was done which showed heterogeneous opacity in right middle and lower zone. It also showed severe thoracolumbar scoliosis (Cobb's angle of 55°). His electrocardiogram (ECG) showed right ventricle strain pattern with sinus tachycardia.

On day 6 in ICU, he was gradually weaned off from inotropes. On day 8 in ICU, we planned for elective surgical tracheostomy in anticipation of prolonged ventilatory support in this patient. A 7.5mm internal diameter cuffed tracheostomy tube (Portex®) was placed under all aseptic conditions. Surprisingly, after tracheostomy we observed a persistent increase in peak airway pressure (>40 cm H2O) on ventilator. On auscultation we found grossly decreased breath sounds on left side of the chest in all regions. Immediately ultrasound of the chest was done to rule out the possibility of pnemothorax ('Lung Sliding Sign' present). Aggressive chest physiotherapy and tracheal suctioning was done but with no further improvement. Chest X-ray (AP view) was done thereafter to visualize the position of the tracheostomy tube. We found that the tip of the tracheostomy tube was endobronchial in right principal bronchus due to the distortion in the airway anatomy probably due to severe thoracic scoliosis (Figure 1). We subsequently planned for replacement of the existing tracheostomy tube with another tracheostomy tube of same size but with an adjustable flange (Vygon®) to prevent endobronchial intubation. The new tracheostomy tube was inserted and the flange was adjusted after confirming the position of the distal tip of tube in mid trachea by fiberoptic bronchoscope and subsequently on chest X- ray (Figure 2). We immediately observed decline in peak airway pressures.

Figure 1: Arrow showing right endobronchial position of tracheostomy tube

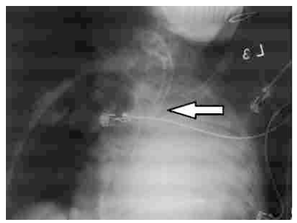
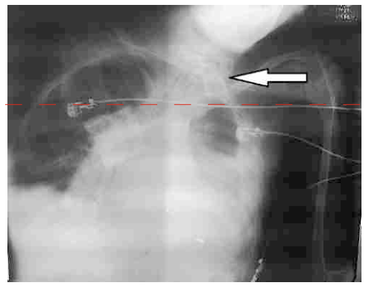


Figure 2: Arrow showing mid tracheal position of tracheostomy tube (with an adjustable fixation collar)



An aggressive nutrition plan was followed after calculation of ideal body weight and body mass index. After discussion with the dietician, "pulmonary" feed rich in protein and low in carbohydrates was given. Effective sputum clearance was achieved by manual insufflation-exsufflation technique. By day 15 in ICU, patient was weaned off from SIMV mode of ventilation and was kept on continuous positive airway pressure (CPAP) mode. Over the next 10 days pressure support on this mode was gradually decreased. During this time we observed a pattern of night awakening with day time somnolence with $PaC0_2$ retention (55 to 60 mm Hg) on arterial blood gas (ABG) analysis. On day 28 in ICU, we planned for spontaneous breath trial with gradual increase in time interval with successful outcomes. Patient was clinically stable and oriented and generating adequate tidal volume with satisfactory ABG findings. On day 32 in ICU, we decannulated the patient after fulfilling the decannulation criteria according to our ICU protocol and he was kept on venturimask (FIO2-0.40). Patient was allowed oral sips of water and juices which were well tolerated. Two days after the decannulation he had an episode of choking and aspiration during feeding followed by cyanosis and bradycardia. He was recannulated with the same size tracheostomy tube with an adjustable flange and was kept on SIMV mode of ventilation. Aggressive chest physiotherapy was initiated. By day 60 in ICU, the patient was again weaned off from the ventilator support. We planned for keeping the patient permanently on tracheostomy tube with provision for humidification (TRACH-VENT®, Hudson RCI™).This device also comes with another device (OXY-VENT®, Hudson RCI™) which snaps over TRACH-VENT® to allow delivery of supplemental oxygen, if needed. On day 63, patient was transferred to the medicine ward, with instruction to continue feeding through nasogastric tube. However in ward 3 days later patient again had an episode of severe respiratory distress but unfortunately could not be revived even with the best possible resuscitation measures.

Discussion

Duchenne muscular dystrophy (DMD) is one of the most common forms of muscular dystrophy. The disease is sex-linked, with an inheritance pattern of 1 case per 3500 live male births.[2,3] DMD occurs almost exclusively in boys. DMD is associated with a gradual loss of muscle function. Loss of respiratory muscle strength does not allow for effective cough and ventilation, eventually leading to pneumonia, atelectasis, and respiratory insufficiency.[4] Once ambulation is restrained, patients tend to develop worsening muscle contractures and rapidly progressive thoracolumbar scoliosis.[6] On average, for each 10° of thoracic scoliosis curvature, the forced vital capacity (FVC) decreases by 4%.[5] This decrease in FVC could rapidly become fatal. Despite modern advances in gene therapy and molecular biology, DMD has no cure. With proper care and attention, patients have a better quality of life than they would otherwise, but most still die by the time they are age 30 years, usually as a result of cardio-respiratory failure. Cardiac disease is the second most common cause of death in person with DMD, with 10–20% of individuals dying of cardiac failure.[7] Symptoms of nocturnal hypoventilation are common and include gradually increasing tendency for insomnia, daytime somnolence, and morning headache.

The mainstay of therapy in critically ill patients of DMD remains assisted ventilation, nutritional support and effective mucous clearance. Non invasive positive

pressure ventilation in DMD has resulted in apparently slower rate of decline in pulmonary function.[8,9] However severely sick patients in critical care settings certainly require invasive ventilation. In our case the patient was hemodynamically unstable and had severe respiratory distress thus a potential subject for invasive ventilatory support.

We planned for early tracheostomy after anticipating prolonged ventilatory support with success to an extent. Advantages of a tracheostomy include the ability to provide higher ventilator pressures in patients with intrinsic lung disease or severe reductions in chest wall compliance (for example, secondary to scoliosis), and the ability to do direct airway suctioning during respiratory infections. Phonation can be restored either by using speaking tracheostomy tubes (Blom® Tracheostomy Tube system, Portex® Trach-Talk™ Blue Line® Tracheostomy Tubes) or by capping the conventional tracheostomy tube with the cuff deflated thus allowing "leak" around the tube. These patients associated with scoliosis are well known to have distorted airway anatomy.[10] We preferred tracheostomy tube with an adjustable flange or fixation collar which is easily available nowadays (Portex® Blue Line®, Bivona® Adult TTS™ Adjustable Neck Flange Hyperflex™, Vygon®). The adjustable fixation collar of these tracheostomy tubes may avert the complications such as endobronchial intubation or airway trauma in presence of the anomalous airway anatomy.[11] Although speaking tracheostomy tubes with an adjustable flange are still not available in the market thus we try to restore the phonation by intermittent cuff deflation with capping during the weaning period.

Effective airway clearance is critical for patients with DMD to prevent atelectasis and pneumonia. Ineffective airway clearance can hasten the onset of respiratory failure and death. In our patient we used mechanical insufflation-exsufflation technique for airway clearance.[12] In this technique, cough is stimulated by providing large tidal volume breath via a standard manual resuscitator (AMBU® bag) followed by a negative pressure exsufflation. In Patients with DMD with tracheostomy in situ, mechanical insufflation-exsufflation offers added advantages over traditional suctioning which includes clearance of secretions from peripheral airways and improved patient comfort thereafter.

Nutrition is a critical aspect of long-term management of patient with DMD. Although there are no data on nutrition and respiratory muscle strength in DMD, malnutrition has been associated with increased respiratory disease in these conditions. Reasons for malnutrition in late stages of DMD are primarily related to weakness and lack of coordination of the muscles of chewing and swallowing. In our patient, the help of a nutritionist was employed to plan out a tailor made" pulmonary" diet rich in protein and low in carbohydrates which can help in improving the worsening respiratory functions. Nearly 1/3 of patients with DMD complain of choking while eating, and with the progression in disease, there may be a risk of pulmonary aspiration while feeding.[13] Our patient also had episode of severe choking which eventually resulted in aspiration pneumonites during the recovery phase when we started the oral feeding. Intensivists should be vigilant during the period of oral feeding in these patients to avoid such complications.[13] Nasogastric feeding tube or feeding percutaneous gastrostomy/jejunostomy can be considered in advanced stages of disease.[10] Several studies advocate the early use of steroids to preserve muscle function in DMD.[14- 16] However, there is no evidence and data that support their efficacy in critically ill patients.

Critical care providers should not forget the fact that duchenne muscle dystrophy is sequentially a fatal condition. Although the advances in medical care have resulted in prolonged survival for people with progressive neuromuscular disorders, it may paradoxically contribute to an inability of medical providers to relieve suffering when patients approach death. Care for someone in the terminal stages of a progressive chronic illness should focus on enhancement of quality of life for the patient and their family. The goals of end of life care for patients with muscular dystrophy may include palliative care for distressing clinical situations such as pain, addressing psychosocial concerns of the patient and their families and judicious use of various treatment modalities and informed choices concerning various forms of treatment and long term ventilation strategies.

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PERIOPERATIVE MANAGEMENT OF A CHILD WITH HAEMOPHILIA B

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Abstract

Haemophilia B (Christmas disease) is a rare congenital bleeding disorder and any surgical procedure in an affected patient can be associated with haemorrhagic complications. We report a successfully managed case of emergency laparotomy in a child with Haemophilia B. The clinicians should aim to achieve adequate levels of Factor IX in the perioperative period and take necessary precaution to avoid haemorrhagic complications. Surgery in haemophilia is associated with an exceptionally high risk of bleeding and associated complications, and perioperative management still remains a great challenge. A team approach is required to improve prognosis in such patients.

Key-words - Haemophilia B, Perioperative concerns, Emergency surgery, Factor IX, Paediatric

Introduction

Christmas disease, also known as Haemophilia B, is a congenital bleeding disorder due to lack of essential blood clotting factor IX. Before the widespread use of replacement therapy, patients with severe haemophilia had a short life span and diminished quality of life. Advancements in blood transfusion practices have in recent years have increased the feasibility of successful surgery on haemophilic patients. We report a successfully managed case of a child with known haemophilia B disease undergoing emergency laparotomy.

Case History

A six year old male child weighing 20 kg was referred to our hospital with acute pain abdomen and vomiting; and a provisional diagnosis of perforation peritonitis for further management. There was history of easy bruising and development of calf hematomas on trivial fall while walking since early childhood. On investigations, he was found to be suffering from severe Christmas disease (factor IX <1%). There was history of two previous admissions to the hospital for uncontrolled dental bleed and calf hematoma that necessitated factor IX transfusion.

In the present episode, he was admitted at another hospital with pain abdomen for three days, vomiting and abdominal distension for one day. General examination revealed mild pallor with fever. His heart rate was 130 per minute and regular; arterial blood pressure was 106/70 mm Hg. Air entry was decreased at the base of both the lungs. Abdominal examination revealed generalized guarding with tenderness. There was rebound tenderness and evidence of free fluid on percussion. Bowel sounds were absent. Digital rectal examination showed an empty rectum.

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X-ray abdomen showed free gas under diaphragm. CT scan suggested significant ascites; gross dilation of jejunal loops; small para-aortic lymph nodes; and minimal bilateral pleural effusion. X ray chest showed bilateral minimal pleural effusion. Preoperative investigation showed haemoglobin-8.5 gm/dL; total leucocyte count of 18500/ cu. mm and normal renal functions tests and serum electrolyte. Coagulation profile showed activated prothrombin time (aPTT) of 33 sec (control-31sec) and prothrombin time (PT) of 13.3 sec (control-12.9 sec).

An emergency exploratory laparotomy was planned. After consultation amongst paediatrician, haematologists, anaesthesiologists and paediatric surgeon, 2000 IU (100U/kg) of intravenous factor IX were given one hour prior to surgery. Adequate amount packed red blood cells, fresh frozen plasma (FFP) and Factor IX were arranged.

After taking high risk consent, patient was taken to the operation theatre. Monitoring for cardiac rhythm, SpO_2, and temperature were initiated. The child was premedicated with 40µg fentanyl and induced with intravenous thiopentone 125mg and succinylcholine 40mg with rapid sequence induction. Gentle larnygoscopy was done and the trachea was intubated with no. 5 uncuffed endotracheal tube. NIBP monitor interval was set at 15 minutes instead of our routine protocol of 5 minutes to decrease repeated compression and hematoma formation. Abdominal exploration revealed 200ml of blood collection in the pelvis and paracolic gutters. A perforation was found at the tip of an inflamed appendix and appendectomy was done. Surgeons also proceeded gently for securing haemostasis with electrocautery and suture ligation. One unit of packed red cells was transfused during surgery.

Intraoperative period was uneventful. Patient was extubated and shifted to intensive care unit for observation and further management. Patient was given vancomycin and piperacillin-tazobactum for antibiotic cover and intravenous tramadol for pain relief avoiding any intramuscular injections. Patient was given factor IX 1200 IU twice a day.

On 2nd postoperative day, patient's PT was normal but aPTT was 41(control-26.5); yet patient showed no signs of spontaneous bleeding. On 4th postoperative day patient was allowed oral clear liquids. Next day, the patient developed abdominal distension with bilious aspirates through nasogastric tube and passage of black coloured stool. X-ray abdomen showed post-exploratory laparotomy gas under diaphragm. Coagulation profile showed PT as noncoagulable and aPTT of 87.3 seconds (control-26.5 sec) suggesting disseminated intravascular coagulation. Patient was transfused 3 units of FFP on the same day and 2 units on next day. In view of E.coli grown in the abdominal pus culture and sensitivity reports, antibiotics were changed to amikacin and meropenem instead of piperacillin-tazobactum. USG abdomen did not show any collection in abdominal cavity. In view of persisting paralytic ileus, patient was again kept nil per orally and put on conservative management. On 7th postoperative day-patient coagulation profile improved with PT of 15.6 seconds (control-12.6 sec) and aPTT-35.6 seconds (control-26.5sec). No episode of black coloured stool was reported after FFP transfusion. Abdominal distension decreased and patient was gradually started on oral feeding which was tolerated. The child was discharged on the 14th post-operative day. The child is well in follow up after 6 months.

Discussion

Haemophilia B, also known as Christmas disease, is an X linked recessive condition of genetic origin. The worldwide incidence of the condition is 1 case per 25000 male individuals and represents 1/4th -1/5th of all patients with haemophilia. It is divided into three grades on the basis of percentage of the normal levels of factor IX concentration in blood i.e. a) Severe - <0.01-05IU/ml (<1%) b) Moderate-0.01-0.05 IU/ml (1-5%); and c) Mild- 0.05-0.4IU /ml (5-40%).[1]
The diagnosis is made on the basis of family history and laboratory findings of decreased factor IX levels;

elevated PTT, normal prothrombin time, bleeding time and platelet counts. The patient's haemoglobin may be low because of occult blood loss. Serum bilirubin may be elevated. In approximately 30% patients, there is no previous family history of disease indicating that there is high genetic mutation rate due to the effect of unknown external factors in our environment. Index case in this report was also probably a case of mutation as there was no positive family history. Our patient's parents gave history of spontaneous calf haematomas and dental bleed for which he had two admissions in hospital for factor IX transfusions.

The rationale of prophylactic treatment is to maintain clotting factor activity above 1% and Factor IX is given as 30-50IU /kg,2 times/wk. Despite being effective, it is time consuming, expensive and compliance issues limit its utility.[2] Many acute and chronic complications may arise during management of a patient with Haemophilia. These include life threatening haemorrhages, arthropathy, transfusion related infections (HIV, Hepatitis B and C) and development of inhibitors. Complications are likely to be higher in emergency situation as clinicians may not be aware of condition preoperatively or may not get sufficient time to optimize the patient before taking up for anaesthesia and surgery.[3] Whenever a haemophiliac patient is diagnosed, every attempt should be made to develop a relationship with a regional haemophilia centre where team of experienced nurse, social worker, genetic counsellor and haematologists provide a comprehensive care to patient and his family.

There are many peri-operative concerns in the management of patients with Haemophilia B.

a) Preoperative concerns:All patients should be admitted even for minor procedures and diagnostic workup for haemorrhage should be done. Coagulopathy should be corrected immediately and not delayed pending diagnostic testing. Clinician must consult anaesthesiologists, haematologists and blood bank officer. Adequate amount of blood, FFP, cryoprecipitate and factor IX should be arranged.

Factor IX is recommended for acute haemorrhage. Its activity level should be corrected to 100% of normal for potentially serious bleeding and 30-50% of normal for minor haemorrhage. Quantity of factor IX required to correct the activity level can be estimated as-weight (kg) x desired level (%) x 1. Multiplying factor is taken as 1 for plasma derived factor and 1.4 for recombinant factor.[4,5]

b) Operative concerns: Movement of patient should be gentle. Pressure points should be padded to prevent intramuscular hematoma or haemarthrosis.[6] Vascular access should be done with care and central venous cannulation, if necessary, should be done under ultrasound guidance. Regional anaesthesia should be avoided. Laryngoscopy to facilitate intubation should be gentle to avoid submucosal haemorrhage while avoiding nasal intubation. Surgeons should attempt to schedule the surgery during the day to help access to laboratory, keeping minimum operative time, and ensuring gentle handling of the tissues. Surgeon should maintain strict asepsis and take extreme care of haemostasis.[7,8] Creation of closed spaces should be avoided. Pressure bandages should be used in soft tissue injuries.

c) Postoperative concerns: Analgesics such as NSAIDS should not be given as it can predispose to GIT bleeding. Patient controlled analgesia is a safe alternative to regional analgesia and intramuscular injections.[9] Bandages should be changed only when necessary. Postoperative levels of factor IX should be monitored and kept at an optimal level. Factor IX is given for 7-14 days or until healing.[10] In addition to conventional coagulation factor concentrates, other agents like FFP, Cryoprecipitate, Desmopressin (DDAVP),

Tranexamic acid, Epsilonaminocaproic acid, Danazol and aminoglycoside can also help to control bleeding.[11]

It is important to have close coordination between the paediatrician, paediatric surgeon, anaesthesiologists, haematologist and the intensivists to have improved outcome in these cases. One should aim to correct the deficiency of Factor IX in the perioperative period to allow optimal wound healing. If due attention is given and necessary precautions are taken in the perioperative period, haemorrhagic complications in patients of haemophilia undergoing surgery can be reduced.

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Acknowledgements

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