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UNDERSTANDING THE ADVANCED TRAUMA LIFE SUPPORT FROM RADIOLOGY POINT OF VIEW IN SAUDI ARABIA

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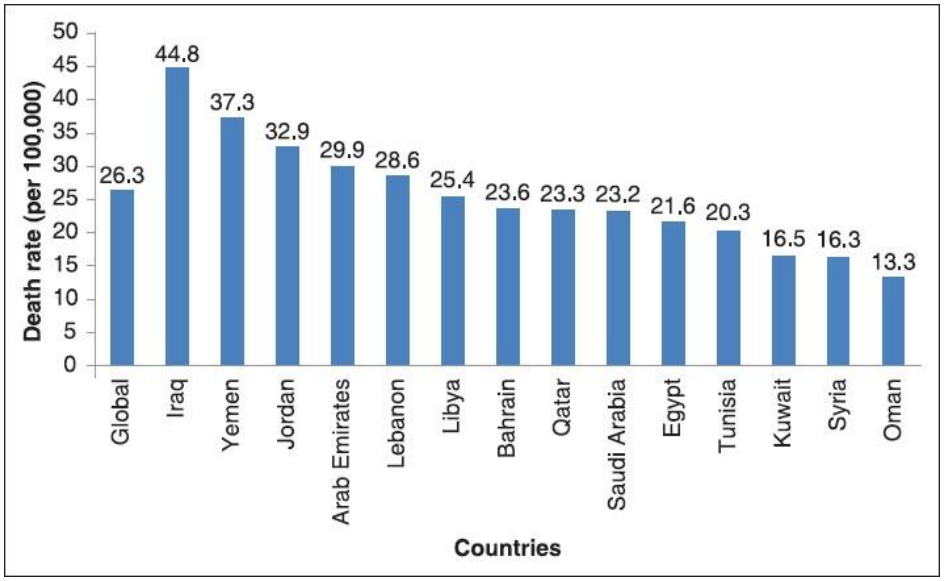
INTRODUCTION

Trauma is the major cause of death among the Saudi population below 40 years of age. It is also a major cause of disability among the patients, making life inconvenient for the patient and also his family. Over the period of time it has been observed that there are short-comings with the Trauma Life support management that can be assessed with the variability of the mortality rate in different countries around the world with equal economic value hospitals but with different care given by the professional health care providers and also the techniques used.[1] The survival of the patient affected by Trauma is basically dependent on the effective identification of the alterations caused by the Trauma in the anatomical and physiological aspects of the patient.

For any Trauma patient, the initial care provided plays a key role in the survival of the patient. The standard initial management of trauma basically aims to identify the serious problems affecting the airways, respiration and blood circulation.[2] The initial management of trauma need to be immediate, in a proper order giving more importance to priorities of survival of the patient. The problems with the airways, respiration and blood circulation are the major cause of avoidable deaths worldwide.

The globally accepted protocol for the initial management of trauma is Advanced Trauma Life Support [ALTS®]. The advanced Trauma Life Support instrument provides the standard care for management of severe trauma patients. The ALTS® program is used to train and educate the health care providers to follow one specific, safe, reliable method to detect, identify and manage the severe problems with Trauma patient.[3] It's an organized approach to provide a common rule for evaluation and management of severe trauma patients. The

trauma team shares equal knowledge about the ALTS® to be followed step by step to manage the severe trauma patient.



The Advanced Trauma Life Support [ALTS®] offers a simple concept of ABCDE that is the order of priority of steps to be taken for proper management of trauma. A: Airways and cervical spine protection, B: Breathing, C: Circulation, D: Disability and E: Exposure or Environment. More importance is given to the first hour care of the patient by assessing, lifesaving, re-evaluation and stabilization of the trauma patient. If necessary the trauma patient need to be transferred to the trauma center.[4]

The Advanced Trauma Life Support [ALTS®] was developed by the American College of Surgeons. The first course for ALTS was held in 1978. Today, the Advanced Trauma Life Support [ALTS®] is worldwide accepted as a standard for the initial care and management of severe trauma patients in more than 50 countries.

Need For Trauma Care in Saudi Arabia

There is an obvious demand for the proper, safe and reliable trauma care to be followed in Saudi Arabia. According to the statistics, trauma is ranked to be the topmost killer of young population in Saudi Arabia. There is a need for the better trauma prevention, pre-hospital care, hospital care, rehabilitation, system administration, trauma care education and training, trauma care evaluation and quality improvement in Saudi Arabia.

Country	Road Deaths	
	Per 100,000 people	Per 100,000 vehicles
Saudi Arabia	49	146
USA	11.6	13.6
UK	3.5	6.2
Australia	5.6	7.6
New Zealand	7.4	10.3

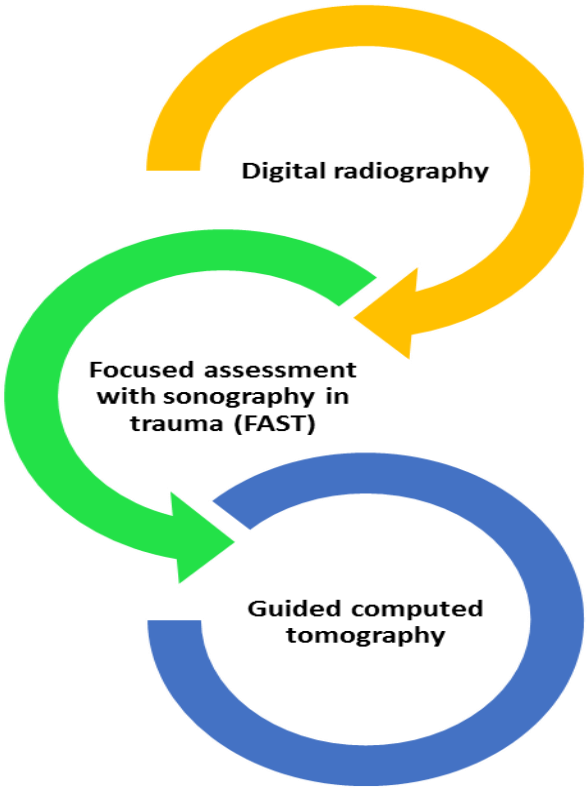
The ineffectively planned road expansions had resulted in more number of road accidents, injuries, disabilities and deaths in Saudi Arabia. The death rate is more among the young population due to violation of the traffic rules. To minimize this the international trauma system was implemented in Saudi Arabia to avoid deaths by proper initial care and management of the trauma patient. The Essential requirements of the Trauma system in Saudi Arabia includes the trauma prevention, pre-hospital care, hospital care, rehabilitation, system administration, trauma care education and training, trauma care evaluation and quality improvement.[5] The recent research shows a decrease in the mortality rate after the implementation of the Advanced Trauma Life Support [ALTS®] in Saudi Arabia. The purpose of this study is to understand the Advanced Trauma Life Support from radiology point of view in Saudi Arabia.

According to the ABCDE concept of Advanced Trauma Life Support [ALTS®], the cervical spine protection is one of the key parts and the first evaluation is done to assess the neurological damage caused to the trauma patient. Computed Tomography [CT] is used to detect and confirm the absence of cervical injuries. Primarily the Focused Assessment and Sonography in Trauma [FAST] is done followed by secondary evaluation from head to foot of the trauma patient using the imaging diagnostic techniques. Firstly the physical examination of the severe trauma patient is done, but this can be limited when the patient is unconscious or internal injury among the elderly patients. The Advanced Trauma Life Support [ALTS®] provides a step-by-step order to follow and manage the STP's [Severe trauma Patients].

Radiology in Severe Trauma in Saudi Arabia

The severe trauma radiology guide followed in Saudi Arabia to manage and care the severe trauma patient is a series of specifications that refers the design, location and technological equipment for diagnosis of injuries in trauma patients as follows

- ✓ Quick action
- ✓ Minimization of number and distance of patient transfers
- ✓ Imaging is to be made more precise than clinical exploration
- ✓ Whole body computed tomography [WBCT] is to be done for clear evaluations
- ✓ Conclusive imaging technique need not be postponed
- ✓ Radiology facilities are to be equipped with the same life support resources available in the critical care ward
- ✓ Trauma centers in which the Multi Detector CT (MDCT) room is not located within or near the critical care area should rehearse patient transfer according to pre-established protocols, with the adoption of plans to modify the location of the MDCT room in future.



Classical Approach of radiology in Trauma Life Support

Digital Radiography

X-rays of the cervical spine, thorax and pelvis

The primary evaluation of severe trauma patients is using the imaging diagnostic techniques like x-rays of cervical spine, thorax and pelvis. This is performed quickly to assess the primary useful information despite the important technical limitations and suboptimal image quality. The use of x-rays is decreased as the computed tomography [CT] systems is more

accessible in present days in emergency care area. Hence, with this regard ALTS® protocol acknowledges the limitations of use of x-rays to detect brain injuries. Research show that x-rays has around 52% sensitivity compared to 98% sensitivity of CT systems. One out of every four trauma deaths relates to the presence of chest injuries.[6] The tensions in the thoracic region can be clinically identified using radiograph or ultrasound but for minute visualizations require CT. The specificity of chest x-rays exceeds 90% but the sensitivity of the technique is low and become worse in critical conditions of severe trauma patients. About 9% of most of the severe trauma patients suffer from pelvic injuries with high probability of serious injuries and bleeding. Radiographs of extremities is to be done during the secondary evaluation when the injuries are identified and treated.

Focused Assessment with Sonography in Trauma (Fast)

The ultrasound is non-invasive, accessible in case of critical patients and also in-expensive and doesn't use any ionizing radiation and hence can be used repeatedly. Whereas the use of Focused assessment with Sonography in trauma [FAST] has limitations to identify the intra-peritoneal fluid. The sensitivity of ultrasound in detecting intra-peritoneal and retro-peritoneal organ injury is very low, despite of experience physicians.[7] In detecting few traumas the sensitivity of ultrasound is much greater when compared to clinical evaluation and other radiography techniques. Ultrasound is also used to detect the pericardial fluid and to assess the cardiac volume. Ultrasound is operator dependent and gives additional information when compared to Computed tomography.[8]

The use of magnetic resonance imaging in severe trauma patients is limited because of prolonged exploration of the patient to radiations and also the use of hostile environment. The use of Magnetic resonance imaging to detect injuries in case of severe trauma patients need to remove any ferromagnetic substances present inside the body of the patient.[9]

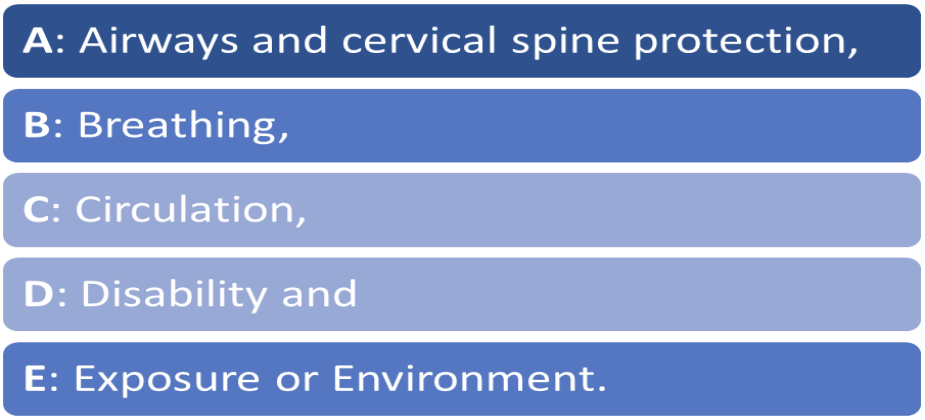
Guided Computed Tomography

The Advanced trauma life support [ATLS®] protocol identifies CT provides good knowledge about internal organ damage and also recognizes the retro-peritoneal, chest and pelvic injuries that are hard to find via. Physical evaluation or FAST. But ATLS also regards it as a slow technique in terms of hemodynamic alterations. Thus clinical observation with the aid of x-rays, ultrasound and CT is recommended for complete diagnosis of the injuries in severe trauma patients. The current CT system used takes only few seconds to diagnose the trauma patient from head to foot along with the detection of problems associated with cervical spine,

thoracic region and pelvis, hence it's called the Whole Body Computed Tomography [WBCT].[10] The high quality imaging resolution of the CT provides great specificity and sensitivity when compared with the clinical examination, ultrasound and radiography in identifying all the injuries in the trauma patient. The WBCT that is done at the initial management of trauma requires a short stay at the ICU and less of the ventilation is needed and less organ failures. The WBCT helps to avoid the un-noticed injuries with less mortality especially in case of severe trauma patients. Recently advanced technique is using Multi-detector CT [MDCT] for the severe trauma patients.[11]

Advanced Trauma Life Support [ALTS®]

The Advanced Trauma Life Support follows a step-by-step order to treat the critical conditions in patients with severe trauma and also helps in assessing the emergency conditions and injuries. This is achieved basically by first determining the injuries followed by treatment and bringing patient back to health.[12] The injuries are determined by doing the primary review that follows the concept of ABCDE.



During the primary review the Airways and also the cervical spine is given top most priority to treat the severe trauma patients. After the airways and cervical spine evaluation, then the breathing is evaluated to determine the effectiveness of breathing and for this pulse oximeter is been used. Chest radiographs are also done if there is any problem with the breathing.[13] After this, the blood pressure and the heart rate is measured and also bleeding is diagnosed using ultrasounds, x-rays and FAST in severe trauma patients. Followed by this the neurological status of the patient is assessed, Glasgow coma score is used to detect the head injuries and also cranial CT is used. The last thing done in the primary review is evaluation and treatment of the burns and effect of chemical or radioactive substances. Soon after the

primary review, the secondary review is done where the severe trauma patient is examined from head to toe using radiographs, CT scans.

Education and Training

All the trained and qualified health care professionals in trauma care need to be hired in all the departments of Trauma. The Advanced Trauma Life Support specific training and education need to be provided following the standard step-by-step concept. The Trauma education program need to be given to physicians, nurses, radiologists and other health care specialist. More and more seminars and lectures need to be organized to increase the knowledge of Advanced Trauma Life Support [ATLS®]. There is very few trained and highly qualified and experienced staff of Trauma especially the Trauma surgeons.[14] The Research and Development of management of new techniques of Trauma care should be done to improve the management and care of severe trauma patients. Research in various issues and aspects of Advanced Trauma Life Support is to be increased in Saudi Arabia and the research work need to be published in various journals and magazines to create more awareness among the health care specialists about it in all different regions of Saudi Arabia. The Trauma care need to present in all the cities including the remote areas of Saudi Arabia to avoid deaths. The radiologists need to be highly trained to do primary and secondary review of the trauma patients and also the introduction of new techniques to detect the unseen injuries and also reduce the time span of evaluation.[15]

CONCLUSION

According to the World Health Organization [WHO], more than nine people die every minute from Trauma. In the GCC, Saudi Arabia ranks second and twenty-third position globally in terms of deaths due to road accidents. It is found in the surveys that internal unseen injuries and improper care at emergency is the main cause of deaths by the road accidents.[16] The major government hospitals in Saudi Arabia collaborate with the international hospitals to build the advance trauma life support to manage the severe trauma patients in Saudi. The ATLS program was first introduced in Saudi Arabia in 1991 at King Fahad National Guard Hospital. The trauma training need to focus on research, training, resuscitation, registry and reception of trauma patients in all regions of Saudi. The ATLS has standardized the approach of trauma patients and is now the standard of care in Saudi Arabia. With ATLS, the trauma care and its knowledge and care is enhanced.[17] The ATLS training in the radiology department has helped to reduce the preventable or potentially avoidable mortality among the

severe trauma patients.[18] All the evaluations that are done for the proper management and care of severe trauma patients like CT scan of brain, CT scan of abdomen, CT scan of spin, CT of angiograph, chest X-ray, abdominal X ray, hand and foot X ray, U/S, CBC, U/E, LFT pregnancy test, tetanus, BUN, ECG, coagulation profile and blood grouping are done to reduce the avoidable deaths in Saudi Arabia.[19,20,21,22] We recommend a well-trained faculty of advanced trauma life support to work in all trauma conditions and disasters, also enhance documentation to improve clinical care for the trauma victims in Saudi Arabia, very significant to enhance the trauma death and disabilities.

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