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RESEARCH ARTICLE

A COMPARATIVE ANALYSIS OF COMPLICATIONS FROM INTERNAL JUGULAR VEIN (IJV) CANNULATION: CONTRASTING THE ANATOMICAL LANDMARK APPROACH WITH ULTRASOUND-GUIDED TECHNIQUE

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Abstract

Central venous pressure monitoring has grown in importance as a tool for treating critically ill patients in recent years.However central line insertion is an invasive procedure which can result in various complications especially due to the puncture of surrounding structures. This study compared the complications arising from ultrasound guided technique versus classical landmark technique of right internal jugular vein cannulation (anterior approach). This study was conducted on 80 patientsof age group above 18 yearsand ofbothgenders,comingtotheemergencymedicinedepartmentofa tertiary care hospital requiring central venous catheterization.Patients were randomly selected into 2 groups each group containing 40 patients. One group of patients were cannulated by the anatomical landmark technique of right internal jugular vein by anterior approach and the other group by USG guided techniqueusing the linear probe. Results showed that in anatomical landmark, majority of the patients presented with carotid artery puncture 4(10%), pneumothorax (2,5%) and hematoma (1,2.5%), whereas in the USG guided did not present with any complications.Hence Ultrasonography is significantly better at avoiding complications during IJV cannulation compared to landmark technique. However higher cost of installation, low accessibility and lack of training in using an ultrasound machine makes its utilisation difficult in smaller centres.

Introduction:-

In management of any patient, vascular access plays a most important role. With advanced knowledge on hemodynamic monitoring, the placement of central venous catheters has been increasing. Central venous pressure monitoring has grown in importance as a tool for treating critically ill patients in recent years.[1]The central venous catheterization is performed to obtain venous access for procedures such as central venous pressure monitoring, insertion pulmonary artery catheter, administration of fluids, drugs and for total parenteral nutrition.[2] There are two techniques for central venous line insertion, anatomical landmark technique and USG guided technique. With the availability of USG in the emergency room, the blind anatomical landmark technique has been gradually replaced by the USG guided CVC. When comparing real-time sonography to the conventional approach, the vein access is improved. Cannulation time is shortened and problems are minimized with ultrasound guidance. However, due to its high cost, this facility might not be provided in many centres. The fact that it requires an experienced operator adds another restriction to its use.IJV cannulation can cause complications like hematoma formation, pneumothorax,

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Haemothorax, carotid artery puncture, brachial plexus irritation. Ultrasound provides better guidance hence helps in reducing these complications when compared to landmark technique.[3]This study is an attempt to compare ultrasound guided technique and classical landmark technique of right internal jugular vein cannulation in term of rate of occurrence of complications.

Methods:-

The study was conducted on 80 patientsof age group above 18 yearsand ofbothgenders,comingtotheemergencymedicinedepartment of a tertiary care hospital over 2 yearsrequiring central venous catheterization.Patients who require central venous catheterization in emergency room was randomly selected into 2 groups each group containing 40 patients. Inclusion criteria included all patients of age above 18 years and of both the sex who requires central venous catheterization and exclusioncriteria included patients with known coagulopathies, burns at the site of cannulation, traumatic injury to neck and platelet counts of less than 50,000/cumm. One group of patients were cannulated by the anatomical landmark technique of right internal jugular vein by anterior approach and the other group by USG guided techniqueusing the linear probe.All USG guided cannulations were done using Mindray Diagnostic Ultrasound System, Model: DC-80. The data was analysed using IBM SPSS 20. The incidence of complications that occurred during both the techniques werecompared. A p- value of less than 0.05 was considered statistically significant.

Results:-

Out of 80 patients, majority of the patients were belonged to the age group of 40-50yrs (24,30%), followed by 30-40yrs (18,22.5%), 50-60yrs (15,18.75%), 60-70yrs (12,15%) and 20-30yrs (1, 1.25%) respectively. Majority of patients were males accounting for 57 out of 80 (71.25%) with remaining 23 patients being females. Road Traffic Accidents formed majority of the indications for central line insertion constituting 19 out of 80 patients (23.75%) followed by Burns 13 out of 80 (16.25%) and septic shock 10 out 80(12.5%). Comparing complications, out of 40 patients who underwent cannulation using anatomical landmark technique, the most common complication was carotid artery puncture which affected 4 patients (10%), followed by pneumothorax which occurred in 2 patients (5%) and hematoma of neck which occurred in 1 patient (2.5%).Whereas, in the USG guided technique none of them presented with any complications. None of the patients suffered from brachial plexus injury or haemothorax. A p- value of 0.08 was obtained. There was clear difference between the number of patients suffering from complications using ultrasound when compared to the classical landmark technique.

Table:- Distribution of study subjects based on complications.

Complications	Sub-variables	Anatomical Landmark	USG Guided	P value
Pneumothorax	Yes	2 (5%)	0	0.08
Hematoma	Yes	1 (2.5%)	0	
Carotid artery puncture	Yes	4 (10%)	0	
Total		40 (100%)	40(100%)	

Discussion:-

The advent of ultrasound brought a drastic improvement patient care especially in emergency rooms as it helps in diagnosing as well as guiding therapeutic procedures. Multiple studies have been done to compare the efficacies of ultrasound guided technique against the anatomical landmark technique. In a study done by Kunhahamed et al,[4]Seventy patients were enrolled for the study, of which 35 (50%) patients underwent CVC placement by the anatomical landmark technique and 35 (50%) patients by the real-time USG-guided method out of the 70 patients, 54.3% were male and 45.7% were female. Our study had a higher number of male patients which can probably be attributed to road traffic accidents being majority of indications for CVC placement in our study whereas septic shock was the predominant indication in the above study.

In their study, Shrestha BR and Gautam B[5] reported accidental carotid artery punctures in 2 out of 60 patients (3%) in the ultrasound-guided group and 6 out of 60 patients (10%) in the landmark group.Troianos et al,[6] McGee and Gould[7] and Bodenham[8] reported a 5% to 11% incidence of complications from carotid puncture using blind puncture in their studies. Our study showed a similar result with 10% of patients suffering from carotid puncture.Denys BG et al,[3] observed that with ultrasound guidance, carotid artery puncture occurred in 1.7% of patients, brachial plexus irritation in 0.4%, and hematoma in 0.2%. In contrast, the external landmark method

resulted in carotid artery puncture in 8.3% of patients, brachial plexus irritation in 1.7% and hematoma in 3.3%. Gordon AC et al,[9] in their study noted that complications occurred in 20 (2.3%) cases while performing ultrasound guided cannulation of IJV.

There was definite reduction in the number of complications that occurred during IJV cannulation when performed using ultrasound guidance making it superior to anatomical landmark technique, but increased cost of establishment and need for expertise in using it limits its widespread acceptance in small medical centres.

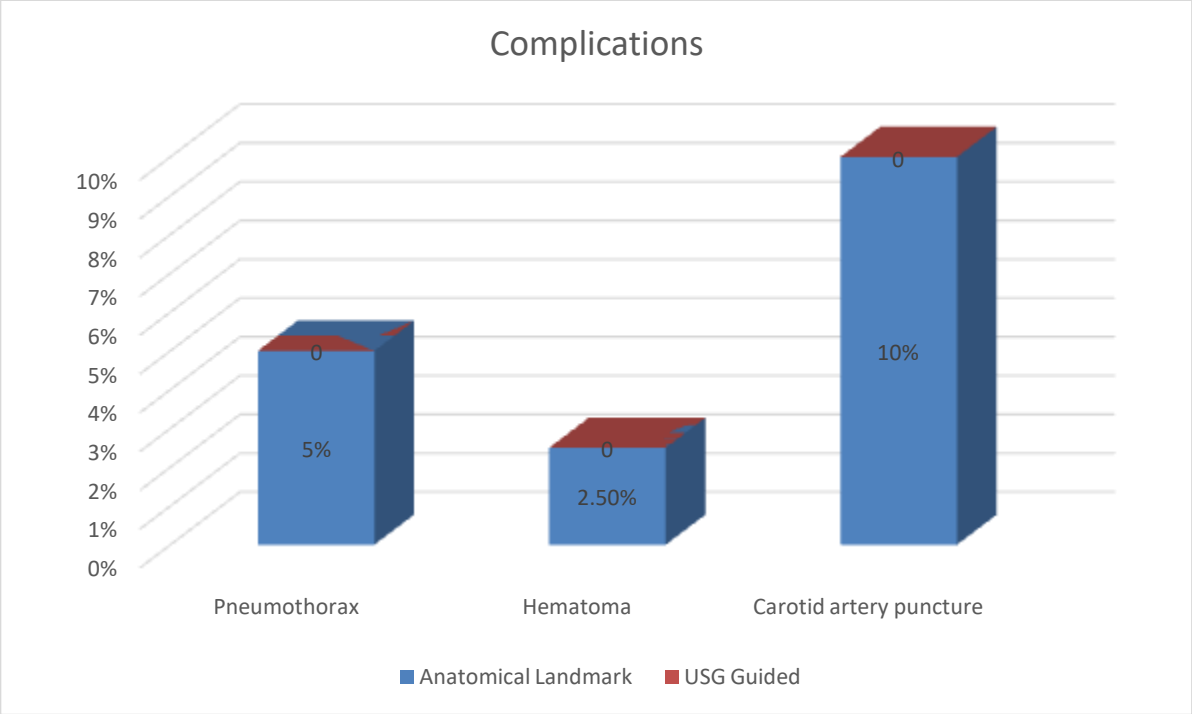

Fig:- Distribution of study subjects based on complications.

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