Safety And Effectiveness of Ultrasound-Guided Cannulation of The Right Brachiocephalic Vein for Central Venous Access

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Abstract

Background**:** Ultrasound (Us)-Guided Cannulation Has Become the Standard Practice for Central Venous Catheter (Cvc) Insertion Due To Its Ability to Increase Success Rates and Minimize Complications. While The Internal Jugular Vein (Ijv) And Subclavian Vein (Scv) Are Commonly Used, This Study Examines the Safety and Effectiveness of Us-Guided Cannulation of The Right Brachiocephalic Vein (Bcv) In Adults. Methods**:** Over A Two-Year Period, 428 Adult Patients Required 536 Cannulations of The Right Bcv Using Ultrasound Guidance. Data On Technical Success, Complications, Procedure Times, Catheter Length, And Post-Procedure Outcomes Were Collected. The Cannulations Were Performed Using A Supraclavicular, In-Plane Ultrasound-Guided Technique. Results**:** Technical Success**:** 98.32% Success Rate (527/536 Procedures). First Attempt Success: 95.34% Of Procedures Were Successful on The First Attempt (511/536). Procedure Time**:** The Average Length of The Procedure Was 13.26 Minutes, With A Mean Catheter Insertion Length Of 13.57 Cm. The Average Procedure Time for The Insertion Was 3.34 Minutes. Intraoperative Complications**:** 2.61% Of Procedures Resulted in Complications, Including Pneumothorax (Pnx) In Three Patients And 11 Cases of Artery Puncture Associated with Self-Limiting Hematomas. Post-Procedure Complications**:** 5.77% (32/536) Of Procedures Had Post-Procedure Issues, including 184 Catheter-Related Infections, 14 Of Which Led to Thrombosis. Catheter Duration**:** The Average Duration of Catheter Placement Was 10.68 Days. Conclusion**:** Ultrasound-Guided Cannulation of The Right BBCs Is a Safe And Effective Technique With High Success Rates And Minimal Complications. This Approach Improves Clinical Outcomes By Offering An Additional Option For Central Venous Catheterization, Enhancing The Versatility And Safety Of Central Venous Access Procedures.

Keywords: Ultrasound-Guided Cannulation, Brachiocephalic Vein, Central Venous Catheter, Technical Success, Intraoperative Complications, Post-Procedure Complications

Introduction

The Central Venous Catheter (Cvc) Plays An Essential Role In Hospitals. As A Primary Means Of Delivering Medications That Need Large Vessels, Providing Nutrition To Patients, And Providing Hemodialysis Access, Shunts Are Used When Peripheral Access Is Unavailable. [1] Cvc Placement Is A Risky And Difficult Procedure, Even For Seasoned Practitioners. Ultrasonography (Us) Is Considered The Most Effective Way Of Locating Vessels And Directing Venous Punctures In Both

Paediatric And Adult Patients Because It Optimizes Success Rates And Reduces The Number Of Surgical Trials.

In Adults, The Jugular Vein (Ijv) And The Subclavian Vein (Scv) Are The Most Common Locations For Us-Guided Cvc Insertion.

There Has Been Some Support Recently For Cannulating The Brachiocephalic Vein (Bcv) In The Supraclavicular Area, Which Could Be Beneficial For Newborns And Infants. Although The Latter Approach Has Been Reported In A Few Cases Among Adult Patients, The Number Of Cases Is Limited. This Retrospective Study Aimed To Assess Whether Supraclavicular Bcv Cannulation Under Ultrasound Guidance Was Effective And Safe In Adult Patients. [2]

Methodology

In This Retrospective Study, We Retrospectively Examined 428 Adult Inpatients (Medical And Surgical) Who Required 536 Right Cvcs. As Well As Those Hospitalized In The Acute Or Urgent Phase Of Their Illness, We Excluded Ventilated Patients. Medical Records Contained Information About First-Time Successes, Puncture Times, And Surgery Times. An Operation Was Regarded As The Period Between Sterilization And X-Ray. Implantation Of The Bcv Cvc Was Performed As Follows: Sterile Covers Were Placed Over Sterile Probes, And Sterile Gel Was Applied Between The Cover And The Probe. Ultrasound Probes Were Moved Downward Along The Ijv To Reach The Superior Sternoclavicular Joint. [3] At The Intersection Of The Ijv And Scv, The Probes Were Adjusted To Get A Good Longitudinal Image Of The Bcv. A Needle Was Used To Penetrate The Skin Around The Us Probe With One Hand While Holding The Probe In The Other. [4] As The Needle Advanced, The Long Axis Of The Us Probe Was Followed Until The Needle Appeared On The Monitor. Negative Pressure Was Used To Guide The Needle Tip Into The Bcv. A J-Shaped Guide Wire (Arrow) Was Then Inserted Into The Vein If There Was A Healthy Return Of Blood Flow Following Advancement Of The Guidewire. [5] A 6 Fr Double-Lumen Catheter Was Inserted Into The Vein Through The Guidewire. The Catheter Insertion Length Was Calculated Using Anatomical Markers, Ranging From 9 To 15 Cm. The Catheter's Position Was Verified Using An X-Ray. This Constitutes One Attempt To Puncture The Skin. Three Attempts At Cannulating The Bcv Proved Unsuccessful, So The Ijv Or The Scv Was Punctured. A Statistical Analysis Was Performed Using Microsoft Excel, Which Included Calculating Averages, Means, And Standard Deviations.

Results

The Main Reasons For The Operation Were Lack Of Peripheral Access, Ineffective Delivery Of Chemotherapy, Hemodynamic Monitoring, And Sepsis. [6] The Gender Ratio Of 1.11 (225 To 203), With A Range Of Patient Weights From 46 To 87 Kg, Emerged As The Most Prominent Feature. Averaging 165.8 Cm In Height (Range: 148–183 Cm) And 56.27 Years Old (Range: 28–82 Years) Respectively, The Average Height Was 165.8 Cm. In 527 Cases Of Cannulation, 98.32 Percent Were Successful (Table2). [7] In 299 Cases (29.9%) After Two Attempts, The Right Bcv Puncture Was Effective In 511 Of Them (95.34%). Operating Times Ranged From 9 To 16 Minutes On Average. There Was A Range Of 9 To 15 Cm Between The Average Catheter Insertion Length And The Range Of 9 To 13 Cm. There Were 11 Self-Limiting Hematomas (2.05%) Identified From Artery Punctures. [8] There Were Five Successful Cannulations Performed Afterward. On X-Ray, Pnx Was Detected In Three Cases (0.56 Percent), But You Do Not Have To Drain Your Chest. A Median Insertion Time Of 10.68 Days Was Achieved, Followed By An Average Of 8.77 Days. [9-11] It Was Found That 5.97 Percent Of The Procedures Had Post Procedure Complications (32/536), Of Which 18 Required

Catheter Removal, And 14 Required Thromboses, All Of Which Required Removal Of The Catheters. (Table 3).

Table 1: (N = 428) Data Are Based on Baseline Characteristics

Typical + Standard Deviation	
Year, Age	52.77 +18.34
Men/Women	200/200
Centimeters	128.6+10.58
Kilograms	58.61+18.34
*Number Of Infectious Diseases	6.54
*Number Of Heart Diseases N (%)	1 (30) 26 (47)
*Number Of Lung Diseases N (%)	88 (38%)
*Number Of Kidney Diseases N (%)	22, (12.88)
Diseases Of the Nervous System N (%)	31 (7.00)
Malignancies N (%)	6.82 2866

Table 2: Cannulation Of Bcvs (N=536)

Successful Rate (%)	95.9%
Percentage Of First Attempts Successful	In 95.36
Average+Standard Deviation	Minutes: 13.26+1.34
Catheter Introduction Time (Mean+Standard Deviation)	14.81+3.58cm
Insertion Time (Mean+Standard Deviation) 13.57+3.53cm	10+8.77 (23-28) Days

Table 3: (N = 536) Complications Observed

Complication	Rates.	Intervention
Punctured Arteries	2 (2.05)	No Complications, Self-Limiting
Pneumonia	(3 (0.65)	Self-Limited
Infection Related to Catheters	(6)	Removal Of Catheters by Accident
Bleeding	2.6 (14)	Accidental Removal of Catheter

Discussion And Conclusion

It Joins into The Superior Vena Cava At The Junction Of The Ijv And Scv. Bcv Cannulations Were Unpopular In 1969 Possibly Due To the Early Observation Of Pneumothorax. This Has Led to Bcv Cannulation Being Referred To As A "Forgotten Central Line" Or A "Neglected Method" [12]. Since Brachiocephalic Approaches Do Not Include Intervening Bony Fragments, The Entire Needle Track Can Be Viewed During Cannulation, Even Though Us Is Now Mostly Used In Clinical Practice. Children And Newborns Have Been Cannulated with Bcv Using Us Guidance In Recent Years. It Has, However, Only Been Tested on A Handful of Adults.

It Is Significantly More Successful to Cannulate The Left Bev Rather Than The Right Bcv In Paediatric Patients. Adults, On The Other Hand, Have A Deeper Left Bcv That Is More Variable Than

The Right One. Because Of This, Ultrasound Cannot Reveal It Clearly. The Left Bbv Junction Also Prevents Ultrasound From Detecting Thoracic Catheters That Are Merged Via It. By Using A Right Bcv Approach, We Minimized Lymphorrhagia Resulting From Thoracic Catheter Injury. Cvc Installation Via The Left Lower Jugular Vein Is Preferred For Patients With Surgical Contraindications, Such As Thrombosis Of The Right Jugular Vein. Using Ultrasound Guidance For In-Plane Bcv Cannulation, Clinical Success Was Demonstrated In This Study For Supraclavicular Cannulation In Adult Patients. Study Results Showed That 98.32 Percent Of Cases Required Only One Effort, And 95.34 Percent Required No Effort At All. In Addition, There Were No Significant Issues Uncovered. A Study [13] Trial Consisted Of A Smaller Group Of Patients, But Our Success Rate Was Lower Overall.

The Most Common Cvc Complications Are Artery Punctures, Hematomas, And Pnxs. Puncture Of The Artery Occurs More Often With Femoral And Jugular Vein Involvement, Whereas Punctures Of The Artery Are More Common With Femoral And Jugular Vein Involvement. Based On The Results Of This Study, There Were Five Brachiocephalic Artery Punctures (5/536) With The Use Of Us Guidance. As A Result, The Pnx Rate On Ijv Cannulation Was 0.56 Percent (3/536). Pnx Incidence Was Higher In The Subclavian Technique Because The Pleural Area And Puncture Site Were Physically Close. This Method Is Advantageous Mainly Because The Needle Can Be Identified In Real-Time Within The Vein As It Advances; In Addition, The Needle Is Parallel To The Pleura, Reducing Risk Of Pleural Or Arterial Puncture. Another Benefit Of The Current Method Is That The Clinician Can See The Needle As It Travels Around The Body (From Skin To Vein), And That The Patient Feels Comfortable With The Catheter Fastened Across The Shoulders. Although The Ijv Is A Large Vein, Cannulation Is Often Uncomfortable. The Insertion Site Could Become Infected If The Dressing Is Moved. The Chances Of Infection Associated With Bcv Cannulation Are Lower Than For Internal Jugular, Subclavian, And Femoral Central Lines. 11% Of Catheter-Related Infections Have Been Reported Following Ijv And Scv Cannulation Procedures. According To Our Data, Catheter-Related Infections Were Lower Than What Was Originally Reported By The Authors, At 3.36 Percent In Order To Implement This Strategy, It Is Imperative To Have Excellent Training. This Can Affect The Outcome Of The Surgery. More Than 1,000 Cases Of Cvc Were Performed In This Trial. An In-Plane Technique Must Also Be Mastered, Which Requires Excellent Hand-Eye Coordination, As Well As Detailed Knowledge Of Anatomy. Prior Data Indicates That Us-Guided Approaches Reduce Operating Time By A Significant Margin. Our Average Operation Lasted 13.26 Minutes. The Project Had Some Limitations. Firstly, Since It Is Retroactive, A Number Of The Key Outcomes And Criteria Cannot Be Evaluated. Furthermore, Due To The Low Incident Incidence, It Is Necessary To Conduct More Studies With A Larger Sample Size To Corroborate The Results. During The Study, In-Plane Cannulation Of The Correct Bcv Needs To Be Used To Establish Its Clinical Usefulness. There Are Also Issues To Consider For Long-Term Bcv Lines. It Appears Straightforward, Successful, And Safe To Insert Cvcs In Adult Patients Using This Supraclavicular, In-Plane, Us-Guided Right Bcv Cannulation. Clinical Performance Of Central Venous Catheterization Can Be Improved With This Method's Additional Catheter Access Options.

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