

BÖLÜM 5

VENÖZ-VASKÜLER GİRİŞİMLERDE ULTRASONOGRAFİ

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Santral venöz kateterizasyon (SVK) uygulamalarının anestezi pratiğindeki yeri her geçen gün daha da önem kazanmaktadır. Amerika Birleşik Devletleri'nde yılda 5,000,000 SVK uygulandığı tahmin edilmektedir. Ameliyat sırasında gereksinim ve kullanımın yanı sıra, periferik damar yoluna erişimin sağlanamadığı durumlarda, postoperatif dönemde yoğun bakımda tetkik ve tedavileri devam edecek hastaların vazopressör ilaç kullanımlarında, beslenmelerinde, kemoterapi ve tanı amaçlı uygulamalarda büyük fayda ve kolaylık sağlamaktadır.

Ultrasonografi Rehberliğinde Periferal Girişimli Santral Kateterizasyon

Periferal girişimli santral kateterizasyon (PGSK), venöz bütünlüğü zayıf hastalarda ve orta dönem venöz kateter ihtiyacı olan hastalarda giderek daha sık kullanılmaktadır. İleri renal hastlığı olanlarda PGSK'dan, daha sonra diyaliz için kullanma ihtiyacı olabileceğinden kaçınılmalıdır. Amerika'da 3 milyon PGSK'nın %70'i hemşireler tarafından takılmakta ve hemşirelere USG ekipman ve eğitiminin sağlanması önerilmektedir (44). Ultrasonografi sayesinde en uygun damar seçilebilir ve tromboz gibi komplikasyonlar azaltılabilir (45-48). Teknik olarak öncelikle Seldinger tekniğini bilen kişilerin yapması gerekmektedir. Hastaya pozisyon verip, enfeksiyon kontrolü sağlandıktan sonra üst extremite USG ile değerlendirilip, en uygun ven ve giriş noktası belirlenmelidir (49). Bazilik, sefalik veya brakiyal venler idantifiye edilip, lokasyon, açıklık, lumen çapı, derinlik ve komşu yapılar açısından incelenmelidir. İlk girişin doğruluğundan emin olununca, kateter yeterli uzunlukta ilerletilir. Kateterin yeri USG ile teyid edilebilir.

Sonuç olarak; santral venöz girişimlerinin azımsanmayacak düzeyde komplikasyonlarının olduğu iyi bilinmektedir. Tecrübeyle bu riskler azalsa da, ortadan tamamen kalkmamaktadır. Ultrasonografi rehberliğindeki girişimlerin, anatomik detaylara hakim olarak varyasyonları önceden saptamak, çevre yapıları ilişkiye görmek, iğnenin doğru noktadan girişini sağlamak, kateterin venin içinde olduğundan emin olmak ve komplikasyonları erken belirlemek gibi önemli avantajları vardır. Bu avantajlar özellikle İJV girişimlerinde anlamlı düzeyde yüksek olup, femoral ve subklavyan ven için henüz bu düzeyde değildir.

Ultrasonografi eşliğinde santral venöz kateterizasyonda iyi düzeye gelebilmek için gerek landmark bağımlı yönteme gerekse standart USG bilgisine hakim olmak gereklidir.

Kaynaklar

1. Raad I. Intravascular catheter related infections. Lancet, 1998;351:893–898
2. Bodenham AR. Ultrasound guided vascular access. In Practical Ultrasound in Anesthesia for Critical Care and Pain Management. Hopkins PM, Bodenham AR, Reeves ST (eds). Informa Healthcare. London, pp 57-71, 2008
3. Mansfield PF, Hohn DC, Fornage BD, Gregurich MA, Ota DM. Complications and failures of subclavian vein catheterization. N Engl J Med, 1994;331:1735-1738.

4. Sznajder JI, Zveibil R, Bitterman H, Weiner P, Bursztein S. Central vein catheterization. Failure and complication rates by three percutaneous approaches. *Arch Intern Med*, 1986;146:259-261.
5. Karakostos D, Labropoulos N, De Groot E, Patrianakos AP, Kouraklis G, Poullaras J, Samonis G, Tsoutsos DA, Konstadoulakis MM, Karabinis A. Real-time ultrasound guided catheterization of the internal jugular vein: a prospective comparison to the landmark technique in critical care patients. *Crit Care*, 2006;10:R162.
6. Forauer AR, Glockner JF. Importance of US findings in planning juguler vein hemodialysis catheter placements. *J Vasc Interv Radiol*, 2000;11:233-238.
7. Hatfield A, Bodenham A. Portable ultrasound for difficult central venous access. *Br J Anaesth*, 1999;82:822-826.
8. KDOQI clinical practice guidelines and clinical practice recommendations for 2006 updates. Hemodialysis adequacy, peritoneal dialysis adequacy and vascular access. *Am J Kidney Dis*, 2006;48:1-322.
9. AIUM Practise Parameter for the Use of Ultrasound to Guide Vascular Access Procedures. American Institute of Ultrasound in Medicine 2012.
10. Mitchell E, Sabado JJ. Principles of ultrasound-guided venous access. UpToDate, 2017.
11. Pittiruti M, Hamilton H, Biffi R, MacFie J, Pertzkiewicz M. ESPEN guidelines on parenteral nutrition: Central venous catheters (access, care, diagnosis and therapy of complications). *Clin Nutr*, 2009;28(4):365-77.
12. Stone MB, Moon C, Sutijono D, Blaivas M. Needle tip visualization during ultrasound guided vascular access: short axis vs long axis approach. *Am J Emerg Med*, 2010; 28:343-7.
13. Tokumine J, Lefor AT, Yonei A, Kagaya A, Iwasaki F, Fukuda Y. Three step method for ultrasound guided central vein catheterization. *Br J Anaesth*, 2013;110: 368-73.
14. Ball RD, Scouras NE, Orebaugh S, Wilde J, Sakai T. Randomized, prospective, observational simulation study comparing residents needle guided vs free-hand ultrasound techniques for central venous catheter access. *Br J Anaesth*, 2012;108:72-9.
15. Mey U, Glasmacher A, Hahn C, Gorschlüter M, Ziske C, Mergelsberg M, Sauerbruch T, Schmidt-Wolf IG. Evaluation of an ultrasound guided technique for central venous access via the internal jugular vein in 493 patients. *Support Care Cancer*, 2003;11:148-155.
16. Moore C. Ultrasound guided procedures in emergency medicine. *Ultrasound Clin*, 2011;6:277-289.
17. Saguel B, Scheeren TWL, Teboul JL. Ultrasound-guided central venous catheter placement. A structured review and recommendations for clinical practice. *Critical Care*, 2017;21:225.

18. Wang R, Snoey ER, Clements RC, Hern HG, Price D. Effect of head rotation on vascular anatomy of the neck: an ultrasound study. *J Emerg Med*, 2006;31:283–286.
19. Moak JH, Lyons MS, Wright SW, Lindsell CJ. Needle and guidewire visualization in ultrasound-guided internal jugular vein cannulation. *Am J Emerg Med*, 2011;29:432–436.
20. Denys BG, Uretsky BF. Anatomical variation of the internal jugular vein. *Crit Care Med*, 1991;19:1516–1519.
21. Hosokawa K, Shime N, Kato Y, Hashimoto S. A randomized trial of ultrasound image-based skin surface marking versus real-time ultrasound-guided internal jugular vein catheterization in infants. *Anesthesiology*, 2007;107:720–724.
22. Brass P, Hellmich M, Kolodziej L, Schick G, Smith AF. Ultrasound guidance versus anatomical landmarks for internal jugular vein catheterization. *Cochrane Database Syst Rev*, 2015;1: Cd006962.
23. Brass P, Hellmich M, Kolodziej L, Schick G, Smith AF. Ultrasound guidance versus anatomical landmarks for subclavian or femoral vein catheterization. *Cochrane Database Syst Rev*, 2015;1: Cd011447.
24. Fragou M, Kouraklis G, Dimitriou V, Karakitsos D. Risk factors for acute adverse events during ultrasound-guided central venous cannulation in the emergency department. *Acad Emerg Med*, 2011;18:443.
25. Skippen P, Kissoon N. Ultrasound guidance for central vascular access in the pediatric emergency department. *Pediatr Emerg Care*, 2007;23:203–207.
26. Calvert N, Hind D, McWilliams RG et al. The effectiveness and cost-effectiveness of ultrasound locating devices for central venous access: a systematic review and economic evaluation. *HealthTechnol Assess*, 2003;7:1-84.
27. Shime N, Hosokawa K, MacLaren G. Ultrasound imaging reduces failure rates of percutaneous central venous catheterization in children. *Pediatr Crit Care Med*, 2015;16 (8):718- 25.
28. Bruzoni M, Slater BJ, Wall J, et al. A prospective randomized trial of ultrasound versus landmark-guided central venous access in the pediatric population. *J Am Coll Surg*, 2013, 216:939 - 43.
29. Milling T, Holden C, Melniker L, Briggs WM, Birkhahn R, Gaeta T. Randomized controlled trial of single-operator vs two-operator ultrasound guidance for internal jugular central venous cannulation. *Acad Emerg Med*, 2006;13:245–7.
30. Bellazzini M, Rankin PM, Gangnon RE, Bjoernsen LP. Ultrasound validation of maneuvers to increase internal jugular vein cross-sectional area and decrease compressibility. *Am J Emerg Med*, 2009;27:454–459.
31. Terai C, Anada H, Matsushima S, Shimizu S, Okada Y. Effects of mild Trendelenburg on central hemodynamics and internal jugular vein velocity, cross-sectional area, and flow. *Am J Emerg Med*, 1995;13:255–258.

32. Lewin MR, Stein J, Wang R, Lee MM et al. Humming is as effective as Val-salva's maneuver and Trendelenburg's position for ultrasonographic visualization of the jugular venous system and common femoral veins. Ann Emerg Med, 2007;50:73–7.
33. Blaivas M, Adhikari S. An unseen danger: frequency of posterior vessel wall penetration by needles during attempts to place internal jugular vein central catheters using ultrasound guidance. Crit Care Med, 2009;37:2345–2349.
34. Stone MB, Hem HG. Inadvertent carotid artery cannulation during ultrasound guided central venous catheterization. Ann Emerg Med, 2007;49:72.
35. Mansfield PF, Hohn DC, Fornage BD, Gregurich MA, Ota DM: Complications and failures of subclavian vein catheterizations. N Engl J Med, 1994;331:1735–1738.
36. Gaultieri E, Deppe S, Sipperly ME, Thompson DR. Subclavian venous catheterization: greater success rate for less experienced operators using ultrasound guidance. Crit Care Med 1995;23:692–697.
37. Pirotte T, Veyckemans F. Ultrasound-guided subclavian vein cannulation in infants and children: a novel approach. Br J Anaesth, 2007;98:509 - 14.
38. Kwon TH, Kim YL, Cho DK. Nephrology dialysis transplantation ultrasound-guided cannulation of the femoral vein for acute haemodialysis access. Nephrol Dial Transplant, 1997;12:1009–1012.
39. Hilty WH, Hudson PA, Levitt MA, Hall JB. Real-time ultrasound-guided femoral vein catheterization during cardiopulmonary resuscitation. Ann Emerg Med, 1996;29:331–337.
40. Aouad MT, Kanazi GE, Abdallah FV et al. Femoral vein cannulation performed by residents: a comparison between ultrasound- guided and landmark technique in infants and children undergoing cardiac surgery. Anesth Analg, 2010;111:724–8.
41. Troianos CA, Hartman GS, Glas KE, Skubas NJ, Eberhardt RT, Walker JD, Reeves ST: Special articles: Guidelines for performing ultrasound guided vascular cannulation: recommendations of the American Society of Echocardiography and the Society Of Cardiovascular Anesthesiologists. Anesth Analg, 2012;114:46–72.
42. Rupp SM, Apfelbaum JL, Blitt C, Caplan RA, Connis RT, Domino KB, Fleisher LA, Grant S, Mark JB, Murray JP, Nickinovich DG, Tung A: Practice guidelines for central venous access: A report by the American Society of Anesthesiologists Task Force on Central Venous Access. Anesthesiology, 2012;116:539–73.
43. Levin PD, Sheinin O, Gozal Y: Use of ultrasound guidance in the insertion of radial artery catheters. Crit Care Med, 2003;31:481–484.
44. Association for Vascular Access. Position Statement: The Use of Ultrasound Guidance by Registered Nurses for Central Venous Catheter Insertion. Herriman, UT; Association for Vascular Access 2010.

- 45.Nichols I, Humphrey JP: The efficacy of upper arm placement of peripherally inserted central catheters using bedside ultrasound and microintroducer technique. *J Infusion Nurs*, 2008;31:165–176.
- 46.Cardella JF, Bacci N, Fox P, Post JH: Cumulative experience with ,273 peripherally inserted central catheters at a single institution. *Radiology*, 1996;7:5–13.
- 47.Stokowski G, Steele D, Wilson D: The use of ultrasound to improve practice and reduce complication rates in peripherally inserted central catheter insertions. *J Infusion Nurs*, 2009;32:145–155.
- 48.Hughes ME: PICC-related thrombosis: pathophysiology, incidence, morbidity and the effect of ultrasound-guided placement technique on occurrence in cancer patients. *J Assoc Vasc Access*, 2011;16:8
- 49.Dawson RB: PICC zone insertion method (ZIMTM): a systematic approach to determine the ideal insertion site for PICCs in the upper arm. *J Assoc Vasc Access*, 2011;16:156