

LOKAL ANESTEZİKLER

8. BÖLÜM

Merve Sena BAYTAR¹

1.Giriş

Lokal anestezi, sinir uçlarında eksitasyonun azalması veya periferik sinirlerde iletim sürecinin inhibisyonu sonucunda vücudun belli bir bölgesinde oluşan duyu kaybı olarak tanımlanmıştır. Bu etkiyi oluşturmak amacıyla kullanılan kimyasal ajanlar lokal anestetiklerdir (1).

2.Etki mekanizması

Lokal anestetikler sinir hücrelerinde bulunan voltaj bağımlı sodyum kanallarındaki spesifik reseptörlere geri dönüşümlü olarak bağlanır ve iyon geçişini önleyerek aksiyon potansiyeli oluşmasını engellerler. Lokal anestetiklerin yüksek konsantrasyonlarında potasyum kanal blokajı da oluşur (2).

Sinir hücrelerinin lokal anestetik ajanlara duyarlılığı temel olarak aksyon çapı ve myelinizasyona bağlıdır. Küçük çaplı lifler büyük çaplı liflere; myelinli lifler myelinsiz liflere göre daha duyarlıdır. Küçük çaplı myelinsiz lifler, büyük çaplı myelinli liflerle karşılaştırıldığında büyük çaplı myelinli lifler daha kolay inhibe olurlar (3).

3.Kimyasal yapı

Lokal anestetik ajanlar; lipofilik aromatik halka, tersiyer yapıda hidrofilik amin halka ve bunların arasında amid ya da ester yapıdaki ara zincir olmak üzere üç kısımdan oluşurlar.

¹ Uz Dr, Kars Kağızman Devlet Hastanesi ,Anesteziyoloji ve Reanimasyon , drmsbaytar@gmail.com

9.Sonuç

Lokal anestezikler modern anesteziyolojide önemli bir farmakolojik araç olmuşturlardır. Anestezi pratiğinde hemen her gün kullandığımız bu ajanların potansiyel riskleri ve yan etkileri vardır. Bu nedenle anestezistler lokal anestezik ajanların etki mekanizmalarını, farmakokinetiklerini, olası yan etkilerini iyi bilmeli, gelişebilecek olası alerjik reaksiyonlar ve lokal-sistemik toksik etkileri erken tanımalı ve tedavi edebilmelidir.

KAYNAKÇA

1. Stanley, F. M. (2020). Handbook of Local Anesthesia.(Seventh Edition). China: Elsevier
2. Brunton, L. L, Hilal-Dandan, R, Knollmann, B. C. (2018). Goodman & Gilman's the Pharmacological Basis of Therapeutics. (Thirteenth Edition). McGraw-Hill Education
3. Butterworth, J. F, Mackey, D. C, Wasnick, J. D. (2018). Morgan & Mikhail's Clinical Anesthesiology. (Sixth Edition). McGraw-Hill Education
4. Becker DE, Reed KL. Essentials of local anesthetic pharmacology. Anesth Prog. 2006 Fall;53(3):98-108;quiz 109-10.
5. Heavner JE. Local anesthetics. Curr Opin Anaesthesiol. 2007;20(4):336-42
6. Columb, MO, MacLennan, K. Local anaesthetic agents. Anaesthesia & Intensive Care Medicine. 2007; 8(4), 159-162.
7. Eti Z. Lokal anestezikler. Tüzüner F, ed. Anestezi Yoğun Bakım Ağrı. 1. Baskı. Ankara: Mn Medikal & Nobel Tıp Kitapevi; 2010. P.225-35.
8. Housman TS, Lawrence N, Mellen BG, et al. The safety of liposuction: results of a natural survey. Dermatol. Surg. 2002;28:971-978.
9. Grazer FM, de Jong RH. Fatal outcomes from liposuction: cencus survey of cosmetic surgeons. Plast Reconstr Surg. 2000; 105:436-446.
10. Tucker GT. Pharmacokinetics of local anesthetics. Br J Anesth.1986;58:717-731.
11. Rosenberg PH, Veering BT, Urmey WF. Maximum recommended doses of local anesthetics: a multifactorial concept. Regional Anesthesia & Pain Medicine. 2004; 29(6), 564-575.
12. Gropper MA, Cohen NH, Eriksson LI, et al. (2020). Miller's Anesthesia. (Ninth Edition). Elsevier
13. Tobias JD. Caudal epidural block: a review of test dosing and recognition of systemic injection in children. Anesth Analg. 2001;93:1156-1161.
14. Popping DM, Elia N, Marret E, et al. Clonidine as an adjuvant to local anesthetics for peripheral nerve and plexus blocks: a meta-analysis of randomized trials. Anesthesiology. 2009;111:495-415.
15. Ping Y, Ye Q, Wang W, et al. Dexmedetomidine as an adjuvant to local anesthetics in brachial plexus blocks: a meta-analysis of randomized controlled trials. Medicine. 2017; 96(4).
16. Kosel J, Bobik P, Tomczyk M. Buprenorphine—the unique opioid adjuvant in regional anesthesia. Expert Review of Clinical Pharmacology. 2016; 9(3), 375-383.
17. Kirksey MA, Haskins SC, Cheng J, et al. Local anesthetic peripheral nerve block adjuvants for prolongation of analgesia: a systematic qualitative review. PloS one. 2015;

- 10(9), e0137312.
18. Choi S, Rodseth R, McCartney CJL. Effects of dexamethasone as a local anaesthetic adjuvant for brachial plexus block: a systematic review and meta-analysis of randomized trials. *British journal of anaesthesia*. 2014; 112(3), 427-439.
 19. Chong MA, Berbenetz NM, Lin C, et al. Perineural versus intravenous dexamethasone as an adjuvant for peripheral nerve blocks: a systematic review and meta-analysis. *Regional Anesthesia & Pain Medicine*. 2017; 42(3), 319-326.
 20. Wong K, Strichartz GR, Raymond SA. On the mechanisms of potentiation of local anesthetics by bicarbonate buffer: drug structure-activity studies on isolated peripheral nerve. *Anesthesia and analgesia*. 1993; 76(1), 131-143.
 21. McLure HA, Rubin AP. Review of local anaesthetic agents. *Minerva anesthesiologica*. 2005; 71(3), 59-74.
 22. Ogle OE, Mahjoubi G. Local anesthesia: agents, techniques, and complications. *Dental Clinics*. 2012; 56(1), 133-148.
 23. El-Boghdady K, Pawa A, Chin KJ. Local anesthetic systemic toxicity: current perspectives. *Local and regional anesthesia*. 2018; 11, 35.
 24. Tokgöz O, Beyaz SG, Arıkanoğlu Z. Toxic reaction related to high dose lidocaine secondary to intravenous regional anesthesia. *J ClinExpInvest*. 2010; 1, 119-21.
 25. Lambert LA, Lambert DH, Strichartz GR. Irreversible conduction block in isolated nerve by high concentrations of local anesthetics. *Anesthesiology: The Journal of the American Society of Anesthesiologists*. 1994; 80(5), 1082-1093.
 26. Kouri ME, Kopacz DJ. Spinal 2-chloroprocaine: a comparison with lidocaine in volunteers. *Anesthesia & Analgesia*. 2004; 98(1), 75-80.
 27. Freedman JM, Li DK, Drasner K, et al. Transient Neurologic Symptoms after Spinal Anesthesia An Epidemiologic Study of 1,863 Patients. *Anesthesiology: The Journal of the American Society of Anesthesiologists*. 1998; 89(3), 633-641.
 28. Joshi GP, Cushner FD, Barrington JW, et al. Techniques for periarticular infiltration with liposomal bupivacaine for the management of pain after hip and knee arthroplasty: a consensus recommendation. *Journal of surgical orthopaedic advances*. 2015; 24(1), 27-35.
 29. Kumar M, Chawla R, Goyal M. Topical anesthesia. *Journal of anaesthesiology, clinical pharmacology*. 2015; 31(4), 450.
 30. Brull SJ, Greene NM. Time-courses of zones of differential sensory blockade during spinal anesthesia with hyperbaric tetracaine or bupivacaine. *Anesthesia and analgesia*. 1989; 69(3), 342-347.
 31. Hong DK, Lawrence HM. Anterior spinal artery syndrome following total hip arthroplasty under epidural anaesthesia. *Anaesthesia and intensive care*. 2001; 29(1), 62-66.
 32. Dippenaar JM. Local anaesthetic toxicity. *Southern African Journal of Anaesthesia and Analgesia*. 2007; 13(3), 23-28.
 33. Culp Jr W. C, Culp WC. Practical application of local anesthetics. *Journal of Vascular and Interventional Radiology*. 2011; 22(2), 111-118.
 34. Guay J. Methemoglobinemia related to local anesthetics: a summary of 242 episodes. *Anesthesia & Analgesia*. 2009; 108(3), 837-845.
 35. Cortazzo JA, Lichtman AD. Methemoglobinemia: a review and recommendations for management. *Journal of cardiothoracic and vascular anesthesia*. 2014; 28(4), 1043-1047.

36. Coleman MD, Coleman NA. Drug induced methaemoglobinaemia. *Drug safety*. 1996; 14(6), 394-405.
37. Kearney TE, Manoguerra AS, Dunford Jr JV. Chemically induced methemoglobinemia from aniline poisoning. *Western Journal of Medicine*. 1984; 140(2), 282.
38. Goluboff N, Wheaton R. Methylene blue induced cyanosis and acute hemolytic anemia complicating the treatment of methemoglobinemia. *The Journal of pediatrics*. 1961; 58(1), 86-89.
39. Harvey JW, Keitt AS. Studies of the efficacy and potential hazards of methylene blue therapy in aniline-induced methaemoglobinaemia. *British journal of haematology*. 1983; 54(1), 29-41.
40. Top WM, Gillman PK, De Langen CJ, et al. Fatal methylene blue associated serotonin toxicity. *Neth J Med*. 2014; 72(3), 179-181
41. Park SY, Lee KW, Kang TS. High-dose vitamin C management in dapsone-induced methemoglobinemia. *The American journal of emergency medicine*. 2014; 32(6), 684-e1.
42. Specca SJ, Boynes SG, Cuddy MA. Allergic reactions to local anesthetic formulations. *Dental Clinics*. 2010; 54(4), 655-664.
43. Zink W, Graf BM. The toxicity of local anesthetics: the place of ropivacaine and levobupivacaine. *Current Opinion in Anesthesiology*. 2008; 21(5), 645-650.
44. Englesson S. The Influence of Acid-Base Changes on Central Nervous System Toxicity of Local Anaesthetic Agents I: An Experimental Study in Cats. *Acta Anaesthesiologica Scandinavica*. 1974; 18(2), 79-87.
45. Gitman M, Barrington MJ. Local anesthetic systemic toxicity: a review of recent case reports and registries. *Regional Anesthesia & Pain Medicine*. 2018; 43(2), 124-130.
46. Di Gregorio G, Neal JM, Rosenquist RW, et al. Clinical presentation of local anesthetic systemic toxicity: a review of published cases, 1979 to 2009. *Regional Anesthesia & Pain Medicine*. 2010; 35(2), 181-187.
47. McNamara PJ, Alcorn J. Protein binding predictions in infants. *Aaps Pharmsci*. 2002; 4(1), 19-26.
48. Anell-Olofsson M, Ahmadi S, Lönnqvist PA, et al. Plasma concentrations of alpha-1-acid glycoprotein in preterm and term newborns: influence of mode of delivery and implications for plasma protein binding of local anaesthetics. *British journal of anaesthesia*. 2018; 121(2), 427-431.
49. Meunier JF, Goujard E, Dubousset AM, et al. Pharmacokinetics of bupivacaine after continuous epidural infusion in infants with and without biliary atresia. *Anesthesiology: The Journal of the American Society of Anesthesiologists*. 2001; 95(1), 87-95.
50. Larsson BA, Lönnqvist PA, Olsson GL. Plasma concentrations of bupivacaine in neonates after continuous epidural infusion. *Anesthesia & Analgesia*. 1997; 84(3), 501-505.
51. Veering BT, Burm AG, van Kleef JW, et al. Epidural anesthesia with bupivacaine: effects of age on neural blockade and pharmacokinetics. *Anesthesia and analgesia*. 1987; 66(7), 589-593.
52. Paqueron X, Boccara G, Bendahou M, et al. Brachial plexus nerve block exhibits prolonged duration in the elderly. *Anesthesiology: The Journal of the American Society of Anesthesiologists*. 2002; 97(5), 1245-1249.
53. Butterworth JF, Walker FO, Lysak SZ. Pregnancy increases median nerve susceptibility to lidocaine. *Anesthesiology: The Journal of the American Society of Anesthesi-*

- ologists. 1990; 72(6), 962-965.
54. Tsen LC, Tarshis J, Denson DD, et al. Measurements of maternal protein binding of bupivacaine throughout pregnancy. *Anesthesia & Analgesia*. 1999; 89(4), 965.
 55. Rosen MA, Thigpen JW, Shnider SM, et al. Bupivacaine-induced cardiotoxicity in hypoxic and acidotic sheep. *Anesthesia and analgesia*. 1985; 64(11), 1089-1096.
 56. Tucker GT, Moore DC, Bridenbaugh PO, et al. Systemic absorption of mepivacaine in commonly used regional block procedures. *Anesthesiology: The Journal of the American Society of Anesthesiologists*. 1972; 37(3), 277-287.
 57. Tucker GT, Mather LE. Clinical pharmacokinetics of local anaesthetics. *Clinical pharmacokinetics*. 1979; 4(4), 241-278.
 58. Neal JM, Barrington MJ, Fettiplace MR, et al. The third American Society of Regional Anesthesia and Pain Medicine practice advisory on local anesthetic systemic toxicity: executive summary 2017. *Regional Anesthesia & Pain Medicine*. 2018; 43(2), 113-123.