

BÖLÜM 27

FAR LATERAL EKSTRAPEDİKÜLER YAKLAŞIMLA BALON KİFOPLASTİ



Cengiz KOPUZ¹

GİRİŞ

Osteoporotik vertebral kompresyon kırıkları (OVKK) genel olarak yaşlı popülasyonu etkiler ve her yıl dünya çapında 1.4 milyon yeni kırık meydana gelir (1-4). Bu kırıklar ciddi ağrı, deformite ve sakatlığa yol açarak yaşam kalitesinin düşmesine neden olur (5). Daha önce yapılmış olan çalışmalarda tek bir OVKK'nın dahi spinal biyomekaniği bozarak ek kırıklara neden olabileceği bildirilmiştir (6). OVKK'nın geleneksel tedavisinde yatak istirahati, ağrı kesiciler, fiziksel destek uygulanmaktadır. Ancak bazı kırıklarda ilerleyici deformite ve şiddetli ağrı kalıcı hale gelmektedir. Bu kırıklärin cerrahi tedavisinde amaç ağrıyi etkin bir şekilde gidermek ve erken stabilizasyonu sağlamak suretiyle kırığın neden olabileceği morbiditelerin önüne geçmektir (7). 1980'lerin sonlarına doğru tarif edilen perkütan vertebroplasti (PV), lokal anestezi altında yapılabilen, kırık olan vertebra gövdesine düşük viskoziteli polimetilmetakrilat (PMMA) enjekte edilerek uygulanan basit bir prosedürdür. Ağrıyı etkin bir şekilde rahatlatır ve hastaların tıbbi durumundan bağımsız olarak kolaylıkla uygulanabilir. Bu mevcut özelliklerinden dolayı bu prosedür OVKK için standart cerrahi yaklaşım haline gelmiştir. İşlem esnasında macun halindeki PMMA, çökmüş olan ver-

tebra gövdesine kalın bir iğne aracılığıyla mekanik kuvvet uygulanarak enjekte edilir. Yeterli miktarda PMMA enjekte edebilmek için, hazırlananan PMMA'nın düşük viskozitede olması gereklidir. İşlem esnasında enjeksiyon basıncını ayarlamadan mümkün olmaması nedeniyle PMMA'nın vertebra gövdesi sınırlarından dışarı taşması (ekstravazasyon) ihtimali göz önünde bulundurulmalıdır. Ayrıca, OVKK sonrası gelişen, gün geçtikçe akciğer kapasitesinde ve abdominal boşlukta azalmaya yol açarak erken ölüme neden olan kifotik deformitenin PV ile düzeltilemesi zordur (8-14). PV vertebra yüksekliğinin yeniden sağlanmasında etkili değildir (5).

Perkütan balon kifoplasti (PBK) ise PV'nin yukarıda bahsedilen eksikliklerini gidermek için Garfin ve ark. tarafından 2001 yılında OVKK'da kullanılmak üzere tarif edilmiştir (15). PBK işlemi vertebrada oluşan yükseklik kaybinin restore edilmesinde ve kifotik deformitenin düzeltilmesinde etkilidir. Ayrıca bu işlem vertebroplasti ve açık cerrahiden daha güvenlidir (16-24).

PBK, çökmüş olan vertebranın gövdesine bir balon yerleştirilmesi sonrası vertebranın üst ve alt end plate'lerinin eski pozisyonuna gelene kadar şişirilmesi esasına dayanır. Şiştirme işleminin ardından balon geri çekilir ve vertebra gövdesinde oluşan boşluğu doldurmak için yüksek vis-

¹ Uzman Doktor, Siirt Eğitim Araştırma Hastanesi Ortopedi ve Travmatoloji Kliniği, drcengizkopuz@gmail.com

zeltilmesinde geleneksel iki balonlu PBK ile karşılaştırıldığında daha verimli yeni bir cerrahi prosedürdür. Ayrıca, daha az zaman almakta ve belirgin komplikasyonlara yol açmayarak ekonomik olarak da etkinlik sağlamaktadır.

KAYNAKÇA

1. Grigoryan M, Guermazi A, Roemer FW, et al. Recognizing and reporting osteoporotic vertebral fractures. InThe Aging Spine 2005 (pp. 22-30). Springer, Berlin, Heidelberg.
2. Delmas PD, van de Langerjt L, Watts NB, et al. Underdiagnosis of vertebral fractures is a worldwide problem: the IMPACT study. Journal of bone and mineral research. 2005 Apr;20(4):557-63.
3. Gronholz MJ. Prevention, diagnosis, and management of osteoporosis-related fracture: a multifactoral osteopathic approach. The Journal of the American Osteopathic Association. 2008 Oct 1;108(10):575-85.
4. Griffith JF. Identifying osteoporotic vertebral fracture. Quantitative imaging in medicine and surgery. 2015 Aug;5(4):592.
5. Song BK, Eun JP, Oh YM. Clinical and radiological comparison of unipedicular versus bipedicular balloon kyphoplasty for the treatment of vertebral compression fractures. Osteoporosis international. 2009 Oct 1;20(10):1717-23.
6. Lindsay R, Silverman SL, Cooper C, et al. Risk of new vertebral fracture in the year following a fracture. Jama. 2001 Jan 17;285(3):320-3.
7. Rebolledo BJ, Gladnick BP, Unnanuntana A, et al. Comparison of unipedicular and bipedicular balloon kyphoplasty for the treatment of osteoporotic vertebral compression fractures: a prospective randomised study. The bone & joint journal. 2013 Mar;95(3):401-6.
8. Gold DT. The clinical impact of vertebral fractures: quality of life in women with osteoporosis. Bone. 1996 Mar 1;18(3):S185-9.
9. Kado DM, Browner WS, Palermo L, et al. Vertebral fractures and mortality in older women: a prospective study. Archives of internal medicine. 1999 Jun 14;159(11):1215-20.
10. Leech JA, Dulberg C, Kellie S, et al. Relationship of lung function to severity of osteoporosis in women 1-3. The American review of respiratory disease. 1990;141(1):68-71.
11. Ross PD. Clinical consequences of vertebral fractures. The American journal of medicine. 1997 Aug 18;103(2):S30-43.
12. Schlaich C, Minne HW, Bruckner T, et al. Reduced pulmonary function in patients with spinal osteoporotic fractures. Osteoporosis International. 1998 May 1;8(3):261-7.
13. Silverman SL. The clinical consequences of vertebral compression fracture. Bone. 1992 Jan 1;13:S27-31.
14. Yuan HA, Brown CW, Phillips FM. Osteoporotic spinal deformity: a biomechanical rationale for the clinical consequences and treatment of vertebral body compression fractures. Clinical Spine Surgery. 2004 Jun 1;17(3):236-42.
15. Garfin SR, Yuan HA, Reiley MA. New technologies in spine: kyphoplasty and vertebroplasty for the treatment of painful osteoporotic compression fractures. spine. 2001 Jul 15;26(14):1511-5.
16. Lieberman IH, Dudeney S, Reinhardt MK, et al. Initial outcome and efficacy of "kyphoplasty" in the treatment of painful osteoporotic vertebral compression fractures. spine. 2001 Jul 15;26(14):1631-7.
17. Berlemann U, Franz T, Orler R, et al. Kyphoplasty for treatment of osteoporotic vertebral fractures: a prospective non-randomized study. European Spine Journal. 2004 Oct 1;13(6):496-501.
18. Deen HG, Aranda-Michel J, Reimer R, et al. Preliminary results of balloon kyphoplasty for vertebral compression fractures in organ transplant recipients. Neurosurgical focus. 2005 Mar 1;18(3):1-4.
19. Feltes C, Fountas KN, Machinis T, et al. Immediate and early postoperative pain relief after kyphoplasty without significant restoration of vertebral body height in acute osteoporotic vertebral fractures. Neurosurgical focus. 2005 Mar 1;18(3):1-4.
20. Ledlie JT, Renfro M. Balloon kyphoplasty: one-year outcomes in vertebral body height restoration, chronic pain, and activity levels. Journal of Neurosurgery: Spine. 2003 Jan 1;98(1):36-42.
21. Ledlie JT, Renfro MB. Decreases in the number and severity of morphometrically defined vertebral body deformities after kyphoplasty. Neurosurgical focus. 2005 Mar 1;18(3):1-5.
22. Phillips FM, Ho E, Campbell-Hupp M, et al. Early radiographic and clinical results of balloon kyphoplasty for the treatment of osteoporotic vertebral compression fractures. Spine. 2003 Oct 1;28(19):2260-5.
23. Theodorou DJ, Theodorou SJ, Duncan TD, et al. Percutaneous balloon kyphoplasty for the correction of spinal deformity in painful vertebral body compression fractures. Clinical imaging. 2002 Jan 1;26(1):1-5.
24. Watts NB, Harris ST, Genant HK. Treatment of painful osteoporotic vertebral fractures with percutaneous vertebroplasty or kyphoplasty. Osteoporosis international. 2001 Jun 1;12(6):429-37.
25. Riggs BL, Melton Lii LJ. The worldwide problem of osteoporosis: insights afforded by epidemiology. Bone. 1995 Nov 1;17(5):S505-11.
26. Corlett B, Cotten A, Boutry N, et al. Percutaneous vertebroplasty in the treatment of osteoporotic vertebral compression fractures: an open prospective study. The Journal of rheumatology. 1999 Oct;26(10):2222-8.
27. Deramond H, Depriester C, Galibert P, et al. Percutaneous vertebroplasty with polymethylmethacrylate: technique, indications, and results. Radiologic clinics of north america. 1998 May 1;36(3):533-46.
28. Amar AP, Larsen DW, Esnaashari N, et al. Percutaneous transpedicular polymethylmethacrylate vertebroplasty for the treatment of spinal compression fractures. Neurosurgery. 2001 Nov 1;49(5):1105-15.

29. Dunnagan SA, Knox MF, Deaton CW. Osteoporotic compression fracture with persistent pain. Treatment with percutaneous vertebroplasty. *The Journal of the Arkansas Medical Society*. 1999 Dec;96(7):258.
30. Jensen ME, Dion JE. Percutaneous vertebroplasty in the treatment of osteoporotic compression fractures. *Neuroimaging clinics of North America*. 2000 Aug 1;10(3):547-68.
31. Wardlaw D, Cummings SR, Van Meirhaeghe J, et al. Efficacy and safety of balloon kyphoplasty compared with non-surgical care for vertebral compression fracture (FREE): a randomised controlled trial. *The Lancet*. 2009 Mar 21;373(9668):1016-24.
32. Cheng X, Long HQ, Xu JH, et al. Comparison of unilateral versus bilateral percutaneous kyphoplasty for the treatment of patients with osteoporosis vertebral compression fracture (OVCF): a systematic review and meta-analysis. *European Spine Journal*. 2016 Nov 1;25(11):3439-49.
33. Huang Z, Wan S, Ning L, et al. Is unilateral kyphoplasty as effective and safe as bilateral kyphoplasties for osteoporotic vertebral compression fractures? A meta-analysis. *Clinical Orthopaedics and Related Research*. 2014 Sep 1;472(9):2833-42.
34. Feng H, Huang P, Zhang X, et al. Unilateral versus bilateral percutaneous kyphoplasty for osteoporotic vertebral compression fractures: A systematic review and meta-analysis of RCTs. *Journal of Orthopaedic Research*. 2015 Nov;33(11):1713-23.
35. Papanastassiou ID, Eleraky M, Murtagh R, et al. Comparison of unilateral versus bilateral kyphoplasty in multiple myeloma patients and the importance of preoperative planning. *Asian spine journal*. 2014 Jun;8(3):244.
36. Masala S, Fiori R, Massari F, et al. Kyphoplasty: indications, contraindications and technique. *La Radiologia medica*. 2005;110(1-2):97-105.
37. Peh WC, Gilula LA. Percutaneous vertebroplasty: indications, contraindications, and technique. *The British Journal of Radiology*. 2003 Jan;76(901):69-75.
38. Gangi A, Guth S, Imbert JP, et al. Percutaneous vertebroplasty: indications, technique, and results. *Radiographics*. 2003 Mar;23(2):e10-.
39. Mueller P, Gangi A, Gangi A, et al. Percutaneous vertebroplasty: indications, technique, and results. In: *Seminars in interventional radiology* 2002 (Vol. 19, No. 3, pp. 265-270).
40. Fourney DR, Schomer DF, Nader R, et al. Percutaneous vertebroplasty and kyphoplasty for painful vertebral body fractures in cancer patients. *Journal of Neurosurgery: Spine*. 2003 Jan 1;98(1):21-30.
41. Ryu KS, Park CK, Kim MK, et al. Single balloon kyphoplasty using far-lateral extrapedicular approach: technical note and preliminary results. *Clinical Spine Surgery*. 2007 Jul 1;20(5):392-8.
42. Kim SY, Seo JB, Do KH, et al. Cardiac perforation caused by acrylic cement: a rare complication of percutaneous vertebroplasty. *AJR Am J Roentgenol*. 2005;185:1245-1247.
42. Kim SY, Seo JB, Do KH, et al. Cardiac perforation caused by acrylic cement: a rare complication of percutaneous vertebroplasty. *American Journal of Roentgenology*. 2005 Nov;185(5):1245-7.
43. Kraus GJ, Achatz W, Görzer HG. Pelvic and leg venous thrombosis as a complication of percutaneous vertebroplasty. *RoFo: Fortschritte auf dem Gebiete der Rontgenstrahlen und der Nuklearmedizin*. 2003 Apr;175(4):565-6.
44. Lee BJ, Lee SR, Yoo TY. Paraplegia as a complication of percutaneous vertebroplasty with polymethylmethacrylate: a case report. *Spine*. 2002 Oct 1;27(19):E419-22.
45. Padovani B, Kasriel O, Brunner P, et al. P. Pulmonary embolism caused by acrylic cement: a rare complication of percutaneous vertebroplasty. *American journal of neuroradiology*. 1999 Mar 1;20(3):375-7.
46. Perrin C, Jullien V, Padovani B, et al. Percutaneous vertebroplasty complicated by pulmonary embolus of acrylic cement. *Revue des maladies respiratoires*. 1999 Apr;16(2):215.
47. Yan L, Jiang R, He B, et al. A comparison between unilateral transverse process-pedicle and bilateral puncture techniques in percutaneous kyphoplasty. *Spine*. 2014 Dec 15;39(26B):B19-26.
48. Wang Z, Wang G, Yang H. Comparison of unilateral versus bilateral balloon kyphoplasty for the treatment of osteoporotic vertebral compression fractures. *Journal of Clinical Neuroscience*. 2012 May 1;19(5):723-6.
49. Grados F, Depriester C, Cayrolle G, et al. Long-term observations of vertebral osteoporotic fractures treated by percutaneous vertebroplasty. *Rheumatology*. 2000 Dec 1;39(12):1410-4.
50. Uppin AA, Hirsch JA, Centenera LV, et al. Occurrence of new vertebral body fracture after percutaneous vertebroplasty in patients with osteoporosis. *Radiology*. 2003 Jan;226(1):119-24.
51. Lin EP, Ekholm S, Hiwatashi A, et al. Vertebroplasty: cement leakage into the disc increases the risk of new fracture of adjacent vertebral body. *American Journal of Neuroradiology*. 2004 Feb 1;25(2):175-80.
52. Kasperk C, Hillmeier J, Nöldge G, et al. Treatment of painful vertebral fractures by kyphoplasty in patients with primary osteoporosis: a prospective nonrandomized controlled study. *Journal of Bone and Mineral Research*. 2005 Apr;20(4):604-12.
53. Komp M. Minimally invasive therapy for functionally unstable osteoporotic vertebral fracture by means of kyphoplasty: prospective comparative study of 19 surgically and 17 conservatively treated patients. *J Miner Stoffwechs*. 2004;11(1):13-5.
54. Silverman SL. Health-Related Quality of Life Subgroup of the Multiple Outcomes of Raloxifene Evaluation Study. The relationship of health-related quality of life to prevalent and incident vertebral fractures in postmenopausal women with osteoporosis: results from Multiple Outcomes of Raloxifene Evaluation Study. *Arthritis Rheum*. 2001;44:2611-9.

55. Ledlie JT, Renfro MB. Kyphoplasty treatment of vertebral fractures: 2-year outcomes show sustained benefits. *Spine*. 2006 Jan 1;31(1):57-64.
56. Majd ME, Farley S, Holt RT. Preliminary outcomes and efficacy of the first 360 consecutive kyphoplasties for the treatment of painful osteoporotic vertebral compression fractures. *The Spine Journal*. 2005 May 1;5(3):244-55.
57. Boszczyk BM, Bierschneider M, Hauck S, et al. Transcostovertebral kyphoplasty of the mid and high thoracic spine. *European spine journal*. 2005 Dec 1;14(10):992-9.
58. Crandall D, Slaughter D, Hankins PJ, et al. Acute versus chronic vertebral compression fractures treated with kyphoplasty: early results. *The Spine Journal*. 2004 Jul 1;4(4):418-24.
59. Pradhan BB, Bae HW, Kropf MA, et al. Kyphoplasty reduction of osteoporotic vertebral compression fractures: correction of local kyphosis versus overall sagittal alignment. *Spine*. 2006 Feb 15;31(4):435-41.
60. Tohmeh AG, Mathis JM, Fenton DC, et al. Biomechanical efficacy of unipedicular versus bipedicular vertebroplasty for the management of osteoporotic compression fractures. *Spine*. 1999 Sep 1;24(17):1772.
61. Steinmann J, Tingey CT, Cruz G, et al. Biomechanical comparison of unipedicular versus bipedicular kyphoplasty. *Spine*. 2005 Jan 15;30(2):201-5.
62. Boszczyk B. Volume matters: a review of procedural details of two randomised controlled vertebroplasty trials of 2009. *European Spine Journal*. 2010 Nov 1;19(11):1837-40.
63. Liebschner MA, Rosenberg WS, Keaveny TM. Effects of bone cement volume and distribution on vertebral stiffness after vertebroplasty. *Spine*. 2001 Jul 15;26(14):1547-54.
64. Chen B, Li Y, Xie D, et al. Comparison of unipedicular and bipedicular kyphoplasty on the stiffness and biomechanical balance of compression fractured vertebrae. *European Spine Journal*. 2011 Aug 1;20(8):1272-80.
65. Chen C, Chen L, Gu Y, et al. Kyphoplasty for chronic painful osteoporotic vertebral compression fractures via unipedicular versus bipedicular approach: a comparative study in early stage. *Injury*. 2010 Apr 1;41(4):356-9.
66. Chen C, Wei H, Zhang W, et al. Comparative study of kyphoplasty for chronic painful osteoporotic vertebral compression fractures via unipedicular versus bipedicular approach. *Clinical Spine Surgery*. 2011 Oct 1;24(7):E62-5.
67. Gang SU, Peng JI, Li FD, et al. Preliminary study on a single balloon cross-midline expansion via unipedicular approach in kyphoplasty. *Chinese medical journal*. 2008 Sep 1;121(18):1811-4.
68. Lee CH, Kim HJ, Lee MK, et al. Comparison of efficacies of unipedicular kyphoplasty and bipedicular kyphoplasty for treatment of single-level osteoporotic vertebral compression fractures: A STROBE-compliant retrospective study. *Medicine*. 2020 Sep 18;99(38).
69. Grohs JG, Matzner M, Trieb K, et al. Minimal invasive stabilization of osteoporotic vertebral fractures: a prospective nonrandomized comparison of vertebroplasty and balloon kyphoplasty. *Clinical Spine Surgery*. 2005 Jun 1;18(3):238-42.
70. Masala S, Cesaroni A, Sergiacomi G, et al. Percutaneous kyphoplasty: new treatment for painful vertebral body fractures. *In Vivo*. 2004 Mar 1;18(2):149-54.