BÖLÜM 7

DİSTAL HUMERUS KIRIKLARI

Davut AYDIN[1]

GİRİŞ

Distal humerus interkondiler kırıkları, dirseğin yumuşak doku yaralanmasını içeren eklem içi parçalı kırıklarıdır. Distal humerus kırığı tedavisinde farklı cerrahi yaklaşımları ve dirsek fonksiyonel sonuçlarını değerlendiriyoruz. Yetişkinlerde distal humerus kırıkları (DHK), tüm kırıkların %2'sini ve tüm humerus kırıklarının yaklaşık %30'unu oluşturmaktadır, yıllık insidansı 5.7/100000'dir[1–4]. Kırık paternleri iki modlu olarak dağılır, genç erkekler (yüksek enerjili travma) ve yaşlı kadın hastalar (osteoporotik kırıklar) arasında farklılık gösterir[1–4]. Distal humerus kırıkları nispeten nadir bir kırık olmakla birlikte, yapılan bir çalışmada 1970 ve 1998 yılları arasında distal humerus kırıklarında 5 kat artış bildirildi ve bu kırıkların insidansı artmaktadır[5]. Bu nedenle, giderek daha yaşlı bir nüfus ve gelişmekte olan dünyanın devam eden motorizasyonu nedeniyle, distal humerus kırıklarının insidansının kalça ve distal radius kırıklarına benzer şekilde artacağı tahmin edilmektedir[5–7]. Distal humerus kırıklarının tedavisi bu bölgenin karmaşık anatomisi, düşük kemik kalitesi ve parçalı kırıkları restore etmedeki güçlük nedeniyle zordur. Tarihsel olarak, bu yaralanmalar konservatif olarak tedavi edilmiştir fakat çoğu çalışma bu yönetimin önemli fonksiyonel bozulma ile ilişkili olduğunu bildirmiştir[4]. İmplant tasarımındaki ve cerrahi teknikteki evrim, cerrahi olarak tedavi edilen hastalarda daha iyi sonuçlara yol açtı ve cerrahi tedavinin mevcut bakım standardı haline gelmesiyle sonuçlandı. Cerrahi tedavi ile iyi veya mükemmel sonuç gösteren uzun süreli hasta takibinde %86'sı tatmin edici sonuç verdiği gösterilmiştir[8,9]. Distal humerus kırıklarının temel tedavi prensibi diğer eklem içi kırıklarınkine benzerdir. Dirsek ekleminin erken mobilizasyona izin vermek için eklemin stabil anatomik rekonstrüksiyonudur. Kemik kalitesi iyi olan hastalarda plak osteosenteziyle (açık redüksiyon internal fiksasyon, ARIF) cerrahi tedavi, standart tedavi olarak kabul edilir. Yaşlılarda, osteoporotik kemik, çok parçalı kırık ve çok distal fragmanlar, yeterli fiksasyon için zorluklar oluşturur. Tedavi seçenekleri, mümkün olduğunda osteosentez veya prospektif karşılaştırmalı çalışmalarda umut vaat eden total dirsek artroplastisini içerir[10].

[1] Dr. Öğr. Üyesi, Yozgat Bozok Tıp Fakültesi, Ortopedi ve Travmatoloji AD., drdavut.aydin@gmail.com

SONUÇ

Distal humerus interkondiler kırıklı hastaların çoğunda geniş bir cerrahi prosedür seçeneklerinin etkili olduğu görülmüştür. Cerrahi yaklaşım cerrahın tecrübesine ve kırık tipine göre değişebilir. En iyi sonuç için kırığın tam redüksiyonu ve stabilizasyonu sonrası erken eklem egzersizlerine başlanmalıdır.

KAYNAKLAR

1. Rose SH, Melton LJ, Morrey BF, Ilstrup DM, Riggs BL. Epidemiologic features of humeral fractures. *Clin Orthop Relat Res*. 1982;No.168:24-30. doi:10.1097/00003086-198208000-00003
2. Anglen J. Distal humerus fractures. *J Am Acad Orthop Surg*. 2005;13(5):291-297. doi:10.5435/00124635-200509000-00001
3. Jupiter JB, Mehne DK. Fractures of the distal humerus. *Orthopedics*. 1992;15(7):825-833. doi:10.1007/978-3-642-96592-0_55
4. Robinson CM, Hill RMF, Jacobs N, Dall G, Court-Brown CM. Adult distal humeral metaphyseal fractures: Epidemiology and results of treatment. *J Orthop Trauma*. 2003;17(1):38-47. doi:10.1097/00005131-200301000-00006
5. Palvanen M, Kannus P, Niemi S, Parkkari J. Secular trends in the osteoporotic fractures of the distal humerus in elderly women. *Eur J Epidemiol*. 1998;14(2):159-164. doi:10.1023/A:1007496318884
6. Palvanen M, Niemi S, Parkkari J, Kannus P. Osteoporotic fractures of the distal humerus in elderly women. *Ann Intern Med*. 2003;139(3). doi:10.7326/0003-4819-139-3-200308050-00021-w2
7. Kannus P, Niemi S, Parkkari J, et al. Why is the age-standardized incidence of low-trauma fractures rising in many elderly populations? *J Bone Miner Res*. 2002;17(8):1363-1367. doi:10.1359/jbmr.2002.17.8.1363
8. McKee MD, Wilson TL, Winston L, Schemitsch EH, Richards RR. Functional outcome following surgical treatment of intra-articular distal humeral fractures through a posterior approach. *J Bone Jt Surg – Ser A*. 2000;82(12):1701-1707. doi:10.2106/00004623-200012000-00003
9. Doornberg JN, Van Duijn PJ, Linzel D, et al. Surgical treatment of intra-articular fractures of the distal part of the humerus: Functional outcome after twelve to thirty years. *J Bone Jt Surg – Ser A*. 2007;89(7):1524-1532. doi:10.2106/JBJS.F.00369
10. McKee MD, Veillette CJH, Hall JA, et al. A multicenter, prospective, randomized, controlled trial of open reduction-internal fixation versus total elbow arthroplasty for displaced intra-articular distal humeral fractures in elderly patients. *J Shoulder Elb Surg*. 2009;18(1):3-12. doi:10.1016/j.jse.2008.06.005
11. Ruan HJ, Liu JJ, Fan CY, Jiang J, Zeng BF. Incidence, management, and prognosis of early ulnar nerve dysfunction in type C fractures of distal humerus. *J Trauma – Inj Infect Crit Care*. 2009;67(6):1397-1401. doi:10.1097/TA.0b013e3181968176
12. Galano GJ, Ahmad CS, Levine WN. Current treatment strategies for bicolumnar distal humerus fractures. *J Am Acad Orthop Surg*. 2010;18(1):20-30. doi:10.5435/00124635-201001000-00004
13. Doornberg J, Lindenhovius A, Kloen P, Van Dijk CN, Zurakowski D, Ring D. Two and three-dimensional computed tomography for the classification and management of distal humeral fractures: Evaluation of reliability and diagnostic accuracy. *J Bone Jt Surg – Ser A*. 2006;88(8):1795-1801. doi:10.2106/JBJS.E.00944
14. Muller M, Nazarian J KP. Fracture and dislocation compendium. Orthopaedic Trauma Association Committee for Coding and Classification. *J Orthop Trauma*. 1996;10 Suppl 1.
15. McKee MD, Jupiter JB, Bamberger HB. Coronal shear fractures of the distal end of the humerus. *J Bone Jt Surg – Ser A*. 1996;78(1):49-54. doi:10.2106/00004623-199601000-00007

16. Dubberley JH, Faber KI, MacDermid JC, Patterson SD, King GJW. Outcome after open reduction and internal fixation of capitellar and trochlear fractures. *J Bone Jt Surg – Ser A*. 2006;88(1):46-54. doi:10.2106/JBJS.D.02954
17. Mehlhoff TL, Bennett JB. Distal humeral fractures: Fixation versus arthroplasty. *J Shoulder Elb Surg*. 2011;20(2):S97-S106. doi:10.1016/j.jse.2010.11.012
18. Nauth A, McKee MD, Ristevski B, Hall J, Schemitsch EH. Distal humeral fractures in adults. *J Bone Jt Surg – Ser A*. 2011;93(7):686-700. doi:10.2106/JBJS.J.00845
19. Aitken SA, Jenkins PJ, Rymaszewski L. Revisiting the "bag of bones": Functional outcome after the conservative management of a fracture of the distal humerus. *Bone Jt J*. 2015;97-B(8):1132-1138. doi:10.1302/0301-620X.97B8.35410
20. Gupta R, Khanchandani P. Intercondylar fractures of the distal humerus in adults: A critical analysis of 55 cases. *Injury*. 2002;33(6):511-515. doi:10.1016/S0020-1383(02)00009-8
21. Ring D, Jupiter JB. Complex fractures of the distal humerus and their complications. *J Shoulder Elb Surg*. 1999;8(1):85-97. doi:10.1016/S1058-2746(99)90063-0
22. Elmadag M, Erdil M, Bilsel K, Acar MA, Tuncer N, Tuncay I. The olecranon osteotomy provides better outcome than the triceps-lifting approach for the treatment of distal humerus fractures. *Eur J Orthop Surg Traumatol*. 2014;24(1):43-50. doi:10.1007/s00590-012-1149-y
23. Zlotolow DA, Catalano LW, Barron OA, Glickel SZ. Surgical exposures of the humerus. *J Am Acad Orthop Surg*. 2006;14(13):754-765. doi:10.5435/00124635-200612000-00007
24. Holdsworth BJ, Mossad MM. Fractures of the adult distal humerus. Elbow function after internal fixation. *J Bone Jt Surg – Ser B*. 1990;72(3):362-365. doi:10.1302/0301-620x.72b3.2341427
25. Jupiter JB, Neff U, Holzach P, Allgower M. Intercondylar fractures of the humerus. An operative approach. *J Bone Jt Surg – Ser A*. 1985;67(2):226-239. doi:10.2106/00004623-198567020-00008
26. Ring D, Gulotta L, Chin K, Jupiter JB. Olecranon osteotomy for exposure of fractures and nonunions of the distal humerus. *J Orthop Trauma*. 2004;18(7):446-449. doi:10.1097/00005131-200408000-00010
27. Zhang C, Zhong B, Luo CF. Comparing approaches to expose type C fractures of the distal humerus for ORIF in elderly patients: Six years clinical experience with both the triceps-sparing approach and olecranon osteotomy. *Arch Orthop Trauma Surg*. 2014;134(6):803-811. doi:10.1007/s00402-014-1983-y
28. Wilkinson JM, Stanley D. Posterior surgical approaches to the elbow: A comparative anatomic study. *J Shoulder Elb Surg*. 2001;10(4):380-382. doi:10.1067/mse.2001.116517
29. Archdeacon MT. Combined olecranon osteotomy and posterior triceps splitting approach for complex fractures of the distal humerus. *J Orthop Trauma*. 2003;17(5):368-373. doi:10.1097/00005131-200305000-00008
30. Cheung E V., Steinmann SP. Surgical approaches to the elbow. *J Am Acad Orthop Surg*. 2009;17(5):325-333. doi:10.5435/00124635-200905000-00007
31. Huang T Le, Chiu FY, Chuang TY, Chen TH. The results of open reduction and internal fixation in elderly patients with severe fractures of the distal humerus: A critical analysis of the results. *J Trauma – Inj Infect Crit Care*. 2005;58(1):62-69. doi:10.1097/01.TA.0000154058.20429.9C
32. Schildhauer TA, Nork SE, Mills WJ, Henley MB. Extensor mechanism-sparing paratricipital posterior approach to the distal humerus. *J Orthop Trauma*. 2003;17(5):374-378. doi:10.1097/00005131-200305000-00009
33. Ek ETH, Goldwasser M, Bonomo AL. Functional outcome of complex intercondylar fractures of the distal humerus treated through a triceps-sparing approach. *J Shoulder Elb Surg*. 2008;17(3):441-446. doi:10.1016/j.jse.2007.08.012
34. Erpelding JM, Mailander A, High R, Mormino MA, Fehringer E V. Outcomes following distal humeral fracture fixation with an extensor mechanism-on approach. *J Bone Jt Surg – Ser A*. 2012;94(6):548-553. doi:10.2106/JBJS.J.01785
35. Chen G, Liao Q, Luo W, Li K, Zhao Y, Zhong D. Triceps-sparing versus olecranon osteotomy for ORIF: Analysis of 67 cases of intercondylar fractures of the distal humerus. *Injury*. 2011;42(4):366-370. doi:10.1016/j.injury.2010.09.004

36. Bryan RS, Morrey BF. Extensive posterior exposure of the elbow. A triceps-sparing approach. *Clin Orthop Relat Res*. 1982;No. 166:188-192. doi:10.1097/00003086-198206000-00033
37. Iselin LD, Mett T, Babst R, Jakob M, Rikli D. The triceps reflecting approach (Bryan-Morrey) for distal humerus fracture osteosynthesis. *BMC Musculoskelet Disord*. 2014;15(1). doi:10.1186/1471-2474-15-406
38. O'Driscoll SW. The triceps-reflecting anconeus pedicle (TRAP) approach for distal humeral fractures and nonunions. *Orthop Clin North Am*. 2000;31(1):91-101. doi:10.1016/S0030-5898(05)70130-9
39. Alonso-Llames M. Bilaterotricipital approach to the elbow: Its application in the osteosynthesis of supracondylar fractures of the humerus in children. *Acta Orthop*. 1972;43(6):479-490. doi:10.3109/17453677208991270
40. Fernández-Valencia JA, Muñoz-Mahamud E, Ballesteros JR, Prat S. Treatment of AO Type C Fractures of the Distal Part of the Humerus through the Bryan-Morrey Triceps-Sparing Approach. *ISRN Orthop*. 2013;2013:1-6. doi:10.1155/2013/525326
41. Campbell WC. Incision for exposure of the elbow joint. *Am J Surg*. 1932;15(1):65-67. doi:10.1016/S0002-9610(32)90997-0
42. Ziran BH, Smith WR, Balk ML, Manning CM, Agudelo JF. A true triceps-splitting approach for treatment of distal humerus fractures: A preliminary report. *J Trauma – Inj Infect Crit Care*. 2005;58(1):70-75. doi:10.1097/01.TA.0000145079.76335.DD
43. Mejía Silva D, Morales de los Santos R, Ciénega Ramos MA, González Pérez C. Functional results of two different surgical approaches in patients with distal humerus fractures type C (AO). *Acta ortopédica Mex*. 2008;22(1):26-30.
44. Illical EM, Farrell DJ, Siska PA, Evans AR, Gruen GS, Tarkin IS. Comparison of outcomes after triceps split versus sparing surgery for extra-articular distal humerus fractures. In: *Injury*. Vol 45. Elsevier Ltd; 2014:1545-1548. doi:10.1016/j.injury.2014.04.015
45. Calfee RP, Wilson JM, Wong AHW. Variations in the anatomic relations of the posterior interosseous nerve associated with proximal forearm trauma. *J Bone Jt Surg – Ser A*. 2011;93(1):81-90. doi:10.2106/JBJS.I.01242
46. O'Driscoll SW. Optimizing stability in distal humeral fracture fixation. In: *Journal of Shoulder and Elbow Surgery*. Vol 14. Mosby Inc.; 2005:S186-S194. doi:10.1016/j.jse.2004.09.033
47. Papaioannou N, Babis GC, Kalavritinos J, Pantazopoulos T. Operative treatment of type C intra-articular fractures of the distal humerus: the role of stability achieved at surgery on final outcome. *Injury*. 1995;26(3):169-173. doi:10.1016/0020-1383(95)93495-4
48. Stoffel K, Cunneen S, Morgan R, Nicholls R, Stachowiak G. Comparative stability of perpendicular versus parallel double-locking plating systems in osteoporotic comminuted distal humerus fractures. *J Orthop Res*. 2008;26(6):778-784. doi:10.1002/jor.20528
49. Athwal GS, Hoxie SC, Rispoli DM, Steinmann SP. Precontoured parallel plate fixation of AO/OTA type C distal humerus fractures. *J Orthop Trauma*. 2009;23(8):575-580. doi:10.1097/BOT.0b013e3181aa5402
50. Shin SJ, Sohn HS, Do NH. A clinical comparison of two different double plating methods for intraarticular distal humerus fractures. *J Shoulder Elb Surg*. 2010;19(1):2-9. doi:10.1016/j.jse.2009.05.003
51. Lee SK, Kim KJ, Park KH, Choy WS. A comparison between orthogonal and parallel plating methods for distal humerus fractures: a prospective randomized trial. *Eur J Orthop Surg Traumatol*. 2014;24(7):1123-1131. doi:10.1007/s00590-013-1286-y
52. Chen RC, Harris DJ, Leduc S, Borrelli JJ, Tornetta P, Ricci WM. Is ulnar nerve transposition beneficial during open reduction internal fixation of distal humerus fractures? *J Orthop Trauma*. 2010;24(7):391-394. doi:10.1097/BOT.0b013e3181c99246
53. Vazquez O, Rutgers M, Ring DC, Walsh M, Egol KA. Fate of the ulnar nerve after operative fixation of distal humerus fractures. *J Orthop Trauma*. 2010;24(7):395-399. doi:10.1097/BOT.0b013e3181e3e273
54. Wiggers JK, Brouwer KM, Helmerhorst GTT, Ring D. Predictors of diagnosis of ulnar neuro-

pathy after surgically treated distal humerus fractures. *J Hand Surg Am*. 2012;37(6):1168-1172. doi:10.1016/j.jhsa.2012.02.045
55. Worden A, Ilyas AM. Ulnar Neuropathy Following Distal Humerus Fracture Fixation. *Orthop Clin North Am*. 2012;43(4):509-514. doi:10.1016/j.ocl.2012.07.019
56. Shearin JW, Chapman TR, Miller A, Ilyas AM. Ulnar Nerve Management with Distal Humerus Fracture Fixation: A Meta-Analysis. *Hand Clin*. 2018;34(1):97-103. doi:10.1016/j.hcl.2017.09.010
57. Sanchez-Sotelo J. Distal humeral fractures: role of internal fixation and elbow arthroplasty. *Instr Course Lect*. 2012;61:203-213. doi:10.1016/S0021-9355(12)70181-9
58. Hughes RE, Schneeberger AG, An KN, Morrey BF, O'Driscoll SW. Reduction of triceps muscle force after shortening of the distal humerus: a computational model. *J Shoulder Elbow Surg*. 1997;6(5):444-448. doi:10.1016/S1058-2746(97)70051-X
59. Sanchez-Sotelo J. Distal humeral fractures: Role of internal fixation and elbow arthroplasty. *J Bone Jt Surg – Ser A*. 2012;94(6):555-568. doi:10.2106/jbjs.946icl
60. McKee MD, Kim J, Kebaish K, Stephen DJ, Kreder HJ, Schemitsch EH. Functional outcome after open supracondylar fractures of the humerus. The effect of the surgical approach. *J Bone Joint Surg Br*. 2000;82(5):646-651. http://www.ncbi.nlm.nih.gov/pubmed/10963158.
61. Gofton WT, MacDermid JC, Patterson SD, Faber KJ, King GJW. Functional outcome of AO type C distal humeral fractures. *J Hand Surg Am*. 2003;28(2):294-308. doi:10.1053/jhsu.2003.50038
62. Theivendran K, Duggan PJ, Deshmukh SC. Surgical treatment of complex distal humeral fractures: Functional outcome after internal fixation using precontoured anatomic plates. *J Shoulder Elb Surg*. 2010;19(4):524-532. doi:10.1016/j.jse.2009.09.011
63. Kimball JP, Glowczewskie F, Wright TW. Intraosseous Blood Supply to the Distal Humerus. *J Hand Surg Am*. 2007;32(5):642-646. doi:10.1016/j.jhsa.2007.02.019
64. Foruria AM, Lawrence TM, Augustin S, Morrey BF, Sanchez-Sotelo J. Heterotopic ossification after surgery for distal humeral fractures. *Bone Jt J*. 2014;96B(12):1681-1687. doi:10.1302/0301-620X.96B12.34091
65. Liu J jian, Ruan H jiang, Wang J guang, Fan C yi, Zeng B fang. Double-column fixation for type C fractures of the distal humerus in the elderly. *J Shoulder Elb Surg*. 2009;18(4):646-651. doi:10.1016/j.jse.2008.12.012
66. Schoch B, Wong J, Abboud J, Lazarus M, Getz C, Ramsey M. Results of Total Elbow Arthroplasty in Patients Less Than 50 Years Old. *J Hand Surg Am*. 2017;42(10):797-802. doi:10.1016/j.jhsa.2017.06.101
67. Githens M, Yao J, Sox AHS, Bishop J. Open reduction and internal fixation versus total elbow arthroplasty for the treatment of geriatric distal humerus fractures: A systematic review and meta-analysis. *J Orthop Trauma*. 2014;28(8):481-488. doi:10.1097/BOT.0000000000000050
68. Koh KH, Lim TK, Lee H Il, Park MJ. Surgical release of elbow stiffness after internal fixation of intercondylar fracture of the distal humerus. *J Shoulder Elb Surg*. 2013;22(2):268-274. doi:10.1016/j.jse.2012.10.024
69. Muller A.M., Sadoghi P., Lucas R., et al. Effectiveness of bracing in the treatment of nonosseous restriction of elbow mobility: A systematic review andmeta-analysis of 13 studies. *J Shoulder Elb Surg*. 2013;22(8):1146-1152. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed11&NEWS=N&AN=2013458897.