

Cervical Orthotics Clinical Reference Bibliography

Cervical Collar Immobilization

- 1) Beavis A. Cervical orthoses. *Prosthetics & Orthotics International*. 13(1):6-13, 1989 Apr.
- 2) "Cervical Collar Routine Skin Care Instructions", Jerome Medical, Moorestown, New Jersey, 1998.
- 3) DeBoer, SL, Seaver, M. Big Head Little Body Syndrome – What EMS Providers Need to Know. *EMS*, July 2004
- 4) DeBoer, SL, Seaver, M. Pediatric Spinal Immobilization: C-Spines, Car Seats, and Color-coded Collars. *Journal of Emergency Nursing* 30(5), October 2004.
- 5) DeBoer, SL, Seaver, M., Broselow, J. Color Coding to Reduce Errors. *American Journal of Nursing*. 105(8), August 2005.
- 6) DeBoer, SL, Seaver, M., Broselow, J. Do you know your ABCs? Airway, breathing, and colour-coding! *Australian Emergency Nursing Journal*, August 2005.
- 7) Ducker TB. Restriction of Cervical Spine Motion by Cervical Collars. Presented at the 58th Meeting of the American Association of Neurological Surgeons. Nashville, Tennessee, April 28 - May 3, 1990.
- 8) Garth GC. Efficacy of five cervical orthoses in restricting cervical motion: a comparison study [letter; comment]. *Spine*. 23(8):961-2, 1998 Apr 15.
- 9) Grundy Laboratory Report: "Comparison Study of Miami J Collar Pads with Cotton/Foam Collar Pads", Philadelphia College of Textiles & Science, 1997.
- 10) Hughes S. Efficacy of five cervical orthoses in restricting cervical motion: a comparison study [letter; comment]. *Spine*. 23(6):744, 1998 Mar 15.
- 11) Johnson RM, Hart DL, Simmons EF, Ramsby GR, Sothwick WO. Cervical Orthoses. A Study Comparing Their Effectiveness in Restricting Cervical Motion in Normal Subjects. *J. Bone Joint Surg. [Am]*. **59-A**:332-339, 1977.
- 12) Johnson RM, Owen JR, Hart DL, Callahan RA. Cervical Orthoses. A Guide to their Selection and Use. *Clin. Ortho. Rel. Res.* **154**:34-45, 1981.
- 13) Kaufman AK, Lunsford TR, Lunsford BR, Lance LL. Comparison of Three Prefabricated Cervical Collars. *Orth. Prosth.* **39**:21-28, 1986.
- 14) Lee TT, Green BA, Petrin DR. Treatment of stable burst fracture of the atlas (Jefferson Fracture) with rigid cervical collar, *Spine* 23 (1998b) 1963-7.
- 15) Marr J, Edmonds V. Cervical orthoses: the issue of patient compliance. *Journal of Neuroscience Nursing*. 22(2):104-7, 1990 Apr.
- 16) "Miami J/Miami Jr. Cervical Collar Sizing and Application Instructions", Jerome Medical, Moorestown, New Jersey, 2004.
- 17) "Miami J Patient Information Handbook", Jerome Medical, Moorestown, New Jersey, 1999.

- 18) Mosenkis, R. "Comparison of Three Cervical Collars in Restricting Cervical Spine Motion", Citech Test Report # 490-421, February 28, 2001.
- 19) Nemeth, JA. *Case Study: A New Approach to the Stabilization of the Cervical Spine in Infants*; The Academy Today, Supplement of the O&P Edge; pages A10-11; April, 2005. As of May 1st, this article will be available online at: <http://www.oandp.org/AcademyTODAY/2005Apr/4.asp>
- 20) Plaiser, B. et al. "Prospective Evaluation of Craniofacial Pressure in Four Different Cervical Orthoses", *Journal of Trauma*, 1993, Vol. 37(5).
- 21) Podolsky S, Baraff LJ, Simon RR, Hoffman JR, Larmon B, Ablon W. Efficacy of cervical Spine Immobilization Methods. *J. Trauma*. 23:461-464, 1983.
- 22) Rosen PB, McSwain NE, Arata M. Stahl S, Mercer D. Comparison of Two New Immobilization Collars. *Ann. Emerg. Med.* 21:1189-1195, 1992.
- 23) Sandler AJ, Dvorak J, Humke T, Grob D, Daniels W. The effectiveness of various cervical orthoses. An in vivo comparison of the mechanical stability provided by several widely used models. *Spine*. 21(14):1624-9, 1996 Jul 15.
- 24) Sharpe KP, Rao S, Ziogas A. Evaluation of the effectiveness of the Minerva cervicothoracic orthosis. *Spine*. 20(13):1475-9, 1995 Jul 1.

Airway and cervical spine alignment/positioning

- 1) (adults) Aprahamian C, Thompson BM, Finger WA, et al. Experimental cervical spine injury model: Evaluation of airway management and splinting techniques. *Ann Emerg Med*. 13:584-587, 1984.
- 2) Burg JM, Fleisher GR. Prehospital care of the injured child. In: Eichelberger MR, ed. *Pediatric Trauma: Prevention, acute care, rehabilitation*. St. Louis : Mosby Year Book, 102, 1993.
- 3) Cattell HS, Filtzer DL. Pseudosubluxation and other normal variations in the cervical spine in children. *J Bone Joint Surg [Am]*. 47A:1295-1309, 1965.
- 4) Curran C, Dietrich AM, Bowman MJ, Ginn-Pease ME, King DR, and Kosnik E. Pediatric cervical-spine immobilization: Achieving neutral position? *J Trauma*. 9(4):729-732, 1995.
- 5) DeBoer, SL, Seaver, M. Big Head Little Body Syndrome – What EMS Providers Need to Know. *EMS*, July 2004
- 6) DeBoer, SL, Seaver, M. Pediatric Spinal Immobilization: C-Spines, Car Seats, and Color-coded Collars. *Journal of Emergency Nursing* 30(5), October 2004.
- 7) DeBoer, SL, Seaver, M., Broselow, J. Color Coding to Reduce Errors. *American Journal of Nursing*. 105(8), August 2005.
- 8) DeBoer, SL, Seaver, M., Broselow, J. Do you know your ABCs? Airway, breathing, and colour-coding! *Australian Emergency Nursing Journal*, August 2005.
- 9) Gaugin LM, Goodman SJ. Cervical spine injuries in infants: problems in management. *J Neurosurg*. 42:179-184, 1975.
- 10) Herzenberg JE, Hensinger RN. Emergency transport and positioning of young children who have an injury of the cervical spine. *JBJS [Am]*. 71A(1):15-22, 1989.

- 11) (adults) Holley J, Jordan R. Airway management in patients with unstable cervical spine fractures. *Ann Emerg Med.* 18:1237-1239, 1989.
- 12) Huerta C, Griffith R, Joyce SM. Cervical Spine Stabilization in Pediatric Patients: Evaluation of Current Techniques. *Ann Emerg Med.* 16:1121-1126, 1987.
- 13) Jones ET, Hensinger RN. Fractures of the Spine. Immobilization. In: *Fractures in Children.* 4th Ed. Vol 3. Lippincott-Raven Publishers, Philadelphia, PA. 1035-1039, 1996.
- 14) (adults) Lord SA, Boswell WC, Willimas JS, Odom JW, Boyd CR. Airway control in trauma patients with cervical spine fractures. *Prehosp Disaster Med.* 9(1):44-49, 1994.
- 15) McSwain NE Jr, Kerstein MD. Airway and cervical spine control. In: *Evaluation and management of trauma.* Norwalk, CT: Appleton-Century-Crofts, 58-59, 1987.
- 16) Nypaver M, Treloar D. Neutral cervical spine positioning in children. *Ann Emerg Med.* 23:208, 1994.
- 17) (adults) Schriger DL, Larmon B, LeGassick T, Blinman T. Spinal immobilization on a flat backboard: does it result in neutral position of the cervical spine? *Ann Emerg Med.* 20:878-881, 1991.
- 18) (adults) Smith M, Bourn S, Larmon B. Ties that bind: immobilizing the injured spine. *J Emerg Med Serv.* 14:28-35, 1989.
- 19) Treloar DJ, Nypaver M. Angulation of the pediatric cervical spine with and without the cervical collar. *Ped Emerg Care.* 13:5-8, 1997.

CTO braces and immobilization capacity:

- 1) Althoff, B, Goldie, IF. Cervical collars in rheumatoid atlanto-axial subluxation: a radiographic comparison. *Ann. Rheum. Dis.* 39:485-489, 1980.
- 2) Benzel, EC, Larson SJ, Kerk, JJ, et al. The Thermoplastic Minerva Body Jacket: A Clinical Comparison with Other Cervical Spine Splinting Techniques. *J. Spinal Disord.* 5:311-319, 1992.
- 3) Dick T, Land R. A guide to spinal immobilization devices. Part 2: Cervical extrication devices. *J Emerg Med Serv.* 8:23-30, 1983.
- 4) Evans, T, LaVorgna, K, Marks, M, Kaye, R. Goniometric Analysis of Cervical and cervicothoracic Orthoses in restricting Neck Motion, Scientific Exhibit: SOCIETY OF TRAUMA NURSES, 5th Annual Conference, Las Vegas, Nevada; March 24, 2002
- 5) Hartman, JT, Palumbo, F, Hill, BJ. Cineradiography of the Braced Normal Cervical Spine. *Clin. Orthop. Rel. Res.* 109:97102, 1975.
- 6) Levine, AM. Spinal Orthoses. *Am. Family Phys.* 29:277-280, 1984.
- 7) Johnson, RM, Hart, DL, Simmons, EF, et al. Cervical Orthoses. A Study Comparing Their Effectiveness in Restricting Cervical Motion in Normal Subjects. *J. Bone Joint Surg. [Am].* 59-A:332-339, 1977.
- 8) Johnson, RM, Hart, DL, Owen JR, et al. The Yale Cervical Orthosis. An evaluation of its effectiveness in restricting cervical motion in normal subjects and a comparison with other cervical orthoses. *Phys Ther.* 58:865-871, 1978.
- 9) Maiman, D, Millington, P, Novack, S, et al. The Effect of the Thermoplastic Minerva Body Jacket on Cervical Spine Motion. *Neurosurg.* 25:363-368, 1989.

- 10) Millington, PJ, Ellington, JM, Hauswirth, BE, et al. Thermoplastic Minerva Body Jacket - A Practical Alternative to Current Methods of Cervical Spine Stabilization. *Phys. Ther.* 67:223-225, 1987.
- 11) Sandler AJ, Dvorak J, Humke T, Grob D, Daniels W. The effectiveness of various cervical orthoses. An in vivo comparison of the mechanical stability provided by several widely used models. *Spine.* 21:1624-9, 1996.
- 12) Sharpe KP, Rao S, Ziogas A. Evaluation of the effectiveness of the Minerva cervicothoracic orthosis. *Spine.* 20:1475-9, 1995.
- 13) Sybert, GW. External Spinal Orthotics. *Neurosurg.* 20:642-649, 1987.
- 14) Vaccaro AR, Lavernia CJ, Botte M, Bergrann K, Garfin SR. Spinal orthoses in the management of spine trauma. In: *Spine Trauma.* Ch 13. Ed: W.B. Saunders, 1998.

Halo: General

- 1) American College of Radiology. MRI monograph: safety and sedation. Reston, VA: American College of Radiology, 1996
- 2) American College of Radiology. American College of Radiology standard for performing and interpreting magnetic resonance imaging (MRI). Reston, VA: American College of Radiology, 2000
- 3) Anderson PA, Budorick TE, et al. Failure of halo vest to prevent in vivo motion in patients with injured cervical spines. *Spine.* 16(suppl):S501, 1991.
- 4) Ballock RT, Lee TQ, Triggs KJ, Woo SL, Garfin SR. The effect of pin location on the rigidity of the halo pin-bone interface. *Neurosurgery.* 26(2):238-41, 1990 Feb.
- 5) Bogen, D. An analysis of halo fixation. Unpublished manuscript, University of Pennsylvania, Prepared for Jerome Medical, 1995.
- 6) Botte MJ, Byrne TP, et al. Application of the halo device for immobilization of the cervical spine utilizing an increased torque pressure. *J. Bone Joint Surg.* 69A:750, 1987.
- 7) Celli P, Palatinsky E. Brain abscess as a complication of cranial traction. *Surg Neuro* 123:594, 1985.
- 8) Chan RC, Schweigel JF, Thompson, BG. Halo-thoracic brace immobilization in 188 patients with acute cervical spine injuries. *J Neurosurg.* 58:508, 1983.
- 9) Clark JA, Kesterton L. Halo pelvic traction appliance for spinal deformities. *J. Biomech.* 4:589, 1971.
- 10) *Clinical Testing of Ceramic-Tipped Halo Pins in the MRI: Human Research Project Summary*; St. Joseph's Hospital/BNI IRB, Phoenix, Sept., 2004
- 11) Connelly GC, Tweardy LA. *Ceramic Skull Pins as Electrical Insulators to Prevent Patient Burning*; October, 2001; Jerome Internal Control Document
- 12) Connelly GC, Tweardy LA. *Mechanical Testing of Ceramic-tipped Skull Pins*; Nov., 2003; Jerome Internal Control Document
- 13) Connelly GC, Tweardy LA, Nemeth JA, Kim, LA. *Maximum Pin Loads during Manual Reduction Maneuvers: The Distraction/Flexion/Rotation Procedure*; Nov. 2003; Jerome Internal Control Document

- 14) Cooper PR, Maravilla KR et al. Halo immobilization of cervical spine fractures: indications and results. *J Neurosurg.* **50**:603, 1979.
- 15) Copley LA, Pepe MD, Tan V, Dormans JP. A comparison of various angles of halo pin insertion in an immature skull model. *Spine.* **24**(17):1777-80, 1999, Sep 1.
- 16) Copley LA, Pepe MD, Tan V, Dormans JP, Gabriel JP, Sheth NP, Asada N. A comparative evaluation of halo pin designs in an immature skull model. *Clinical Orthopaedics & Related Research.* (**357**):212-8, 1998 Dec.
- 17) Danzig LA, Resnick D. The treatment of cervical spine metastasis from the prostate with a halo-cast. *Spine.* **5**:395, 1980.
- 18) Dempsey MF, Condon B, Hadley DM. Investigation of the Factors Responsible for Burns During MRI; *J Magn Resonance Imaging*; 13:627-631; 2001
- 19) Dennis GC, Clifton GL. Brain abscess as a complication of halo fixation. *Neurosurgery.* 10:760-1, 1982.
- 20) Dormans JP, Criscitiello AA, Drummond DS, Davidson RS. Complications in children managed with immobilization in a halo vest. *J. Bone & Joint Surg. - Am.* **77**(9):1370-3, 1995 Sep.
- 21) Dove J, Hsu LC, et al. The cervical spine after halo-pelvic traction: analysis of complications in 83 patients. *J Bone Joint Surg.* **62B**:158, 1980.
- 22) Dove J, Hsu, LC, et al. Spontaneous cervical spine fusion. A complication of halo-pelvic traction. *Spine.* **6**:45, 1981.
- 23) ECRI hazard report: patient death illustrates the importance of adhering to safety precautions in magnetic resonance environments. *Health Devices* 2001;30:311-314
- 24) Eleraky MA, Theodore N, Adams M, Rekatte HL, Sonntag VK. Pediatric cervical spine injuries: report of 102 cases and review of the literature. *J Neurosurg.* 92:12-7, 2000.
- 25) Fleming BC, Huston DR, Krag MH, Sugihara S. Pin force measurement in a halo-vest orthosis, in vivo. *J Biomech.* **31**(7):647-51, 1998 Jul.
- 26) Garfin SR, Botte MJ, et al. Application and maintenance of the halo skeletal fixator. *Update on Spinal Disorders.* **2**:5-8, 1987.
- 27) Garfin SR, Botte MJ, Nickel VL. Complications in the use of the halo. *J Bone Joint Surg [Am].* 69:354, 1987.
- 28) Garfin SR, Botte MJ, Waters RL, et al. Complication in the use of the halo fixation device. *J Bone Joint Surg Am.* 68:320-5, 1986.
- 29) Garfin SR, Botte MJ, et al. Osteology of the skull as it affects halo pin placement. *Spine.* **10**:696, 1985.
- 30) Garfin SR, Lee TQ, et al. Structural behavior of the halo orthosis pin-bone interface: biomechanical evaluation of standard and newly designed stainless steel halo fixation pins. *Spine.* **11**:977-981, 1986.
- 31) Garfin SR, Botte MJ, Triggs KJ, et al. Subdural abscess associated with halo-pin traction. *J Bone Joint Surg Am.* 70:1338-40, 1988.
- 32) Glaser JA, Whitehill R, et al. Complications associated with the halo-vest: a review of 245 cases. *J. Neurosurg.* **65**:762, 1986.
- 33) Ginsburg GM, Bassett GS. Hypoglossal nerve injury caused by halo-suspension traction. A case report. *Spine.* **23**(13):1490-3, 1998 Jul 1.

- 34) Goodman ML, Nelson PB. Brain abscess complicating the use of a halo orthosis. *Neurosurg.* **20**:27-30, 1987.
- 35) Goodman ML, Nelson PB. Brain abscess complicating the use of halo traction. *Spine.* 6:365, 1987.
- 36) Grady M, Howard MA, Jane JA, *et al.* Use of the Philadelphia Collar as an alternative to the halo vest in patients with C-2, C-3 fractures. *Neurosurg.* **18**:151, 1986.
- 37) Hott JT, Kim LJ, Nemeth JA, Tweardy LA. *Novel Glass Composite Halo Ring Eliminates MRI Artifact: Initial Experience; CNS Proceedings; Philadelphia, 2002*
- 38) Hua J, Fox RA. Magnetic resonance imaging of patients wearing a surgical traction halo. *JMRI.* **1**:264-267, 1996.
- 39) Humbyrd DE, Latimer FR, Lonstein JE, *et al.* Brain abscess as a complication of halo traction. *Spine.* 6:365-8, 1981.
- 40) (review includes children) Kameyama O, Ogawa K, Suga T, Nakamura T. Asymptomatic brain abscess as a complication of halo orthosis: report of a case and review of the literature. *J Orthop Sci.* 4:39-41, 1999.
- 41) Kameyama O, Ogawa K, Suga T, Nakamura T. Asymptomatic brain abscess as a complication of halo orthosis: report of a case and review of the literature. *Journal of Orthopaedic Science.* **4**(1):39-41, 1999.
- 42) Kanal E.; Website Correspondence; UPMC Health System Magnetic Resonance Safety Site (<http://kanal.arad.upmc.edu/mrsafety.html>); Mar., 1996
- 43) Kanal E, Borgstede JP, Barkovich AJ, *et al.* ACR White Paper on Magnetic Resonance (MR) Safety; *AJR* 2002; 178:1335 – 1347.
- 44) Kanal E, Borgstede JP, Barkovich AJ, *et al.* ACR White Paper on Magnetic Resonance (MR) Safety: 2004 Update and Revisions; *AJR*, May 2004, 182:1111-1114.
- 45) Kanal E, Shellock FG. SMRI Safety Committee. Policies, guidelines, and recommendations for MR imaging safety and patient management. *J Magn Reson Imaging* 1992;2:247–248
- 46) Kaplan SL, Rocco TP, *et al.* Acute pulmonary edema following removal of a spinal orthosis: an unusual complication of the halo vest. *Arch Phys Med Rehabil.* **71**:255, 1990.
- 47) Kaye AH. Brain abscess after insertion of skull traction. *J Bone Joint Surg [Br].* 64:500, 1982.
- 48) Kim LJ, Hott JT, Nemeth JA, Tweardy LA, Horn EM, Feiz-Erfan I, Bristol RE, Klopfenstein JD, Lekovic GP, Sonntag VKH. *Prospective Analysis of Ceramic Skull Pins for Halo Vest Fixation to Prevent Pin-Heating Phenomenon during MRI; CNS Proceedings, Philadelphia, 2002*
- 49) Kim LJ, Sonntag VKH, Hott JT, Nemeth JA, Klopfenstein JD, Tweardy LA, *Halo Pin-related Scalp Burn Following Magnetic Resonance Imaging: Case Report; unpublished draft.*
- 50) Kim LJ, Sonntag VKH, Hott JT, Nemeth JA, Klopfenstein JD, Tweardy LA, *Scalp burns from halo pins following magnetic resonance imaging: Case Illustration; J Neurosurg; Vol. 99; 186; July, 2003*
- 51) Kerwin GA, Chou KL *et al.* Investigation of how different halos influence pin forces. *Spine.* **19**:1078, 1994.
- 52) Koch RA, Nickel VL *et al.* The halo vest: an evaluation of motion and forces across the neck. *Spine.* **3**:103, 1978.

- 53) Kostuick JP. Indications for the use of halo immobilization. *Clin Orthop.* **154**:46, 1981.
- 54) Kostuick JP, Tooke M. The application of pelvic pins in the halo-pelvic distraction. An anatomic study. *Spine.* **8**:35, 1983.
- 55) Krag, MH, Beynon, BD. A new halo vest: rationale, design, and biomechanical comparison to standard halo-vest designs. *Spine.* **13**:228, 1988.
- 56) Lammens J, Hoogmartens MJ, Fabry G, Mulier JC. Meningoencephalitis and cerebral abscess as a complication of the halo device. *Acta Orthop Belg.* **54**(3):360-2, 1988.
- 57) Lerman JA, Haynes RJ, Koeneman EJ, Koeneman JB, Wong WB. A biomechanical comparison of Gardner-Wells tongs and halo device used for cervical spine traction. *Spine.* **19**(21):2403-6, 1994 Nov 1.
- 58) Letts M, Girouard L, Yeadon A. Mechanical evaluation of four- versus eight-pin halo fixation. *J Ped Orthop.* **17**(1):121-4, 1997 Jan-Feb.
- 59) Letts M, Kaylor D, Gouw G. A biomechanical analysis of halo fixation in children. *JBJS [Br].* **70**-B:277-9, 1988.
- 60) Levine DB, Hankin S. The halo yoke: a simplified device for attachment of the halo to a body cast. *J. Bone Joint Surgery.* **54A**:881, 1972.
- 61) Lind B, Sihlbom H. Forces and motions across the neck in patients treated with halo-vest. *Spine.* **13**:162, 1988.
- 62) Lind B, Sihlbom H. Halo-vest treatment of unstable traumatic cervical spine injuries. *Spine.* **13**:425, 1988.
- 63) Loder RT. Skull thickness and halo-pin placement in children: the effects of race, gender and laterality. *J Ped Ortho.* **16**:340, 1996.
- 64) Mandabach M, Ruge JR, Hahn YS, McLone DG. Pediatric axis fractures: early halo immobilization, management and outcome. *Pediatr Neurosurg.* **19**(5):225-32, 1993.
- 65) Mangum S, Sunderland PM. A comprehensive guide to the halo brace. Application, care, patient teaching. *AORN Journal.* **58**(3):534-46, 1993 Sep
- 66) Manthey DE. Halo traction device. *Emergency Medicine Clinics of North America.* **12**(3):771-8, 1994 Aug.
- 67) Mirza SK, Moquin RR, Anderson PA, Tencer AF, Steinmann J, Varnau D. Stabilizing properties of the halo apparatus. *Spine.* **22**(7):727-33, 1997 Apr 1.
- 68) Murphy MJ, Southwick WO. Complications of halo fixation. *Orthop. Trans.* **3**:126, 1979.
- 69) Nemeth JA, Twearthy LA. "Pin Heating Phenomena" with Use of Halo Fixation in the MRI; ;Thranhardt Lecture Award; Proceedings of AOPA; Washington, DC; 2000
- 70) Nickel VH, Perry J, *et al.* The halo: a spinal skeleton traction fixation device. *J Bone Joint Surg.* **50**:1400, 1968.
- 71) Norton PL, Brown T. The immobilizing efficiency of back braces. *J. Bone Joint Surg.* **39A**:111, 1957.
- 72) O'Brien JP, Yau ACMC, *et al.* Halo-pelvic traction. *J. Bone Joint Surg.* **53B**:217, 1971.
- 73) Obst S.; Test Procedure: ASTM Designation F 1831-97, Section 11; Nov., 2003; Jerome Internal Control Document

- 74) Pande K, Basu S, Webb JK. Transient brain injury from penetration of a halo pin. *Spinal Cord*. **36**(10):732-3, 1998 Oct.
- 75) Perry J. The halo in spinal abnormalities. *Orthop Clin. North Am.* **3**:69, 1972.
- 76) Rizzolo SJ, Piazza MR, Cotler JM, Hume EL, Cautilli G, O'Neill DK. The effect of torque pressure on halo pin complication rates. A randomized prospective study. *Spine*. **18**(15):2163-6, 1993 Nov.
- 77) Romanelli DA, Dickman CA, Porter RW, Haynes RJ. Comparison of initial injury features in cervical spine trauma of C3-C7: predictive outcome with halo-vest management. *Journal of Spinal Disorders*. **9**(2):146-9, 1996 Apr.
- 78) Rosenblum D, Ehrlich V. Brain abscess and psychosis as a complication of a halo orthosis. *Archives of Physical Medicine & Rehabilitation*. **76**(9):865-7, 1995 Sep.
- 79) Saari A, Runciman RJ, Hayward G. Modelling the bioelectric behaviour of halo pin-patient structures during magnetic resonance imaging; Proc. Instn Mech Engrs; Vol. 218, Part H; J Engineering in Medicine, Feb., 2004
- 80) Schweigel JF. Halo-thoracic brace management of odontoid fractures. *Spine*. **4**:192, 1979.
- 81) Shellock FG. MR imaging and cervical fixation devices: evaluation of ferromagnetism, heating, and artifacts at 1.5 telsa. *Magnetic Resonance Imaging*. **14**:1093, 1996.
- 82) Shellock FG, Crues JV. Comments on the ACR White Paper on Magnetic Resonance (MR) Safety; Internet Posting; July, 2002
- 83) Shellock FG. *Pocket guide to MR procedures and metallic objects: update 2001*. Philadelphia, PA: Lippincott Williams & Wilkins Healthcare, 2001:147-148
- 84) Shellock FG, Kanal E. SMRI Safety Committee. Guidelines and recommendations for MR imaging safety and patient management. III. Questionnaire for screening patients before MR procedures. *J Magn Reson Imaging* 1994;4:749-751
- 85) Shellock FG, Kanal E. SMRI Safety Committee. Policies, guidelines, and recommendations for MR imaging safety and patient management. *J Magn Reson Imaging* 1991;1:97-101
- 86) Smith MD, Johnson LJ, Perra JH, Rawlins BA. A biomechanical study of torque and accuracy of halo pin insertional devices. *J. Bone & Joint Surg - Am.* **78**(2):231-8, 1996 Feb.
- 87) Thompson J. The "halo" traction apparatus – a method of external splinting of the cervical spine after injury. *J Bone Joint Surg*. **44B**:655, 1962.
- 88) Triggs KJ, Ballock RT., Byrne T, Garfin SR. Length dependence of a halo orthosis on cervical immobilization. *Journal of Spinal Disorders*. **6**(1):34-7, 1993 Feb
- 89) Triggs KJ, Ballock T. The effect of angled pin insertion on halo pin fixation. *Spine*. **14**:781, 1989.
- 90) Vertullo CJ, Duke PF, Askin GN. Pin-site complications of the halo thoracic brace with routine pin re-tightening. *Spine*. **22**:2514-6, 1997.
- 91) Victor DI, Bresnan MJ, Keller RB. Brain abscess complicating the use of halo traction. *J Bone Joint Surg [Am]*. **55**:635, 1973.
- 92) Voor MJ, Khalily C. Halo pin loosening: a biomechanical comparison of experimental and conventional designs. *J. Biomech*. **31**(4):397-400, 1998 Apr.

- 93) Voor MJ, Anderson RC, Hart RT. Stress analysis of halo pin insertion by non-linear finite element modeling. *J Biomech.* **30**(9):903-9, 1997 Sep.
- 94) Walker PS, Lamswer D, *et al.* Forces in the halo-vest apparatus. *Spine.* **9**:773, 1984.
- 95) Wang GJ, Moskal JT *et al.* The effect of halo vest length on stability of the cervical spine. *J Bone Joint Surg.* **70**:357, 1988.
- 96) Wetzel FT, Dunsieith NW Jr, Kuhlengel KR, Paul EM, Lahey DM. The effectiveness of the cervical halo: open versus closed ring. A preliminary report. *Paraplegia.* **33**(2):110-5, 1995 Feb.
- 97) Whitehill R, Richman JA, *et al.* Failure of immobilization of the cervical spine by the halo vest. *J Bone Joint Surg.* **68**:326, 1986.
- 98) Williams FH, Nelms DK, McGaharan KM. Brain abscess: A rare complication of halo usage. *Arch Phys Med & Rehab.* **73**(5):490-2, 1992 May.
- 99) Whitesides TE, Mehserle WL, Hutton WC. The force exerted by the halo pin. A study comparing different halo systems. *Spine.* **17**(10 Suppl):S413-7, 1992 Oct.
- 100) Wong WB, Haynes RJ. Osteology of the pediatric skull. Considerations of halo pin placement. *Spine.* **19**(13):1451-4, 1994 Jul 1.
- 101) Zieberg AS. *Halo MR Comparison*; Jan, 2004; Jerome Internal Control Document
- 102) Zeiberg AS. *Halo Ring MRI Phantom Comparison*; Sept., 2002; Jerome Internal Control Document

Halo: Studies involving mechanical testing/modeling of the halo apparatus:

- 1) Botte MJ, Byrne TP *et al.* Application of the halo device for immobilization of the cervical spine utilizing an increased torque pressure. *J. Bone Joint Surg.* **69A**:750, 1987.
- 2) Koch RA, Nicke, VL *et al.* The halo vest: an evaluation of motion and forces across the neck. *Spine.* **3**:103, 1978.
- 3) Krag MH, Beynnon BD. A new halo vest: rationale, design, and biomechanical comparison to standard halo-vest designs. *Spine.* **13**:228, 1988.
- 4) Lerman JA, Haynes RJ, Koeneman EJ, Koeneman JB, Wong WB. A biomechanical comparison of Gardner-Wells tongs and halo device used for cervical spine traction. *Spine.* **19**(21):2403-6, 1994 Nov 1.
- 5) Letts M, Girouard L, Yeadon A. Mechanical evaluation of four- versus eight-pin halo fixation. *J Ped Orthop.* **17**(1):121-4, 1997 Jan-Feb.
- 6) Letts M, Kaylor D *et al.* A biomechanical analysis of halo fixation in children. *J Bone Joint Surg [Br].* **70**:277, 1988.
- 7) Lind B, Sihlbom H. Forces and motions across the neck in patients treated with halo-vest. *Spine.* **13**:162, 1988.
- 8) Mirza SK, Moquin RR, Anderson PA, Tencer AF, Steinmann J, Varnau D. Stabilizing properties of the halo apparatus. *Spine.* **22**(7):727-33, 1997 Apr 1.
- 9) Walker PS, Lamswer D *et al.* Forces in the halo-vest apparatus. *Spine.* **9**:773, 1984.

- 10) Unpublished manuscript: Bogen, D. An analysis of halo fixation. Unpublished manuscript, University of Pennsylvania, Prepared for Jerome Medical, 1995.

Halo: Studies involving halo pin testing/modification/placement:

- 1) Ballock RT, Lee TQ, Triggs KJ, Woo SL, Garfin SR. The effect of pin location on the rigidity of the halo pin-bone interface. *Neurosurgery*. **26**(2):238-41, 1990 Feb.
- 2) Copley LA, Pepe MD, Tan V, Dormans JP. A comparison of various angles of halo pin insertion in an immature skull model. *Spine*. **24**(17):1777-80, 1999, Sep 1.
- 3) Copley LA, Pepe MD, Tan V, Dormans JP, Gabriel JP, Sheth NP, Asada N. A comparative evaluation of halo pin designs in an immature skull model. *Clinical Orthopaedics & Related Research*. **(357)**:212-8, 1998 Dec.
- 4) Fleming BC, Huston DR, Krag MH, Sugihara S. Pin force measurement in a halo-vest orthosis, in vivo. *J Biomech*. **31**(7):647-51, 1998 Jul.
- 5) Garfin SR, Botte MJ *et al*. Osteology of the skull as it affects halo pin placement. *Spine*. **10**:696, 1985.
- 6) Garfin SR, Lee TQ *et al*. Structural behavior of the halo orthosis pin-bone interface: biomechanical evaluation of standard and newly designed stainless steel halo fixation pins. *Spine*. **11**:977-981, 1986.
- 7) Kerwin GA, Chou KL *et al*. Investigation of how different halos influence pin forces. *Spine*. **19**:1078, 1994.
- 8) Kostuick JP, Tooke M. The application of pelvic pins in the halo-pelvic distraction. An anatomic study. *Spine*. **8**:35, 1983.
- 9) Loder RT. Skull thickness and halo-pin placement in children: the effects of race, gender and laterality. *J Ped Ortho*. **16**:340, 1996.
- 10) Rizzolo SJ, Piazza MR, Cotler JM, Hume EL, Cautilli G, O'Neill DK. The effect of torque pressure on halo pin complication rates. A randomized prospective study. *Spine*. **18**(15):2163-6, 1993 Nov.
- 11) Smith MD, Johnson LJ, Perra JH, Rawlins BA. A biomechanical study of torque and accuracy of halo pin insertional devices. *J. Bone & Joint Surg - Am*. **78**(2):231-8, 1996 Feb.
- 12) Triggs KJ, Ballock T. The effect of angled pin insertion on halo pin fixation. *Spine*. **14**:781, 1989.
- 13) Vertullo CJ, Duke PF, Askin GN. Pin-site complications of the halo thoracic brace with routine pin re-tightening. *Spine*. **22**(21):2514-6, 1997 Nov 1
- 14) Voor MJ, Khalily C. Halo pin loosening: a biomechanical comparison of experimental and conventional designs. *J. Biomech*. **31**(4):397-400, 1998 Apr.
- 15) Voor MJ, Anderson RC, Hart RT. Stress analysis of halo pin insertion by non-linear finite element modeling. *J Biomech*. **30**(9):903-9, 1997 Sep.
- 16) Whitesides TE, Mehserle WL, Hutton WC. The force exerted by the halo pin. A study comparing different halo systems. *Spine*. **17**(10 Suppl):S413-7, 1992 Oct.
- 17) Wong WB, Haynes RJ. Osteology of the pediatric skull. Considerations of halo pin placement. *Spine*. **19**(13):1451-4, 1994 Jul 1.

Halo: Clinical Studies

- 1) Anderson PA, Budorick TE et al. Failure of halo vest to prevent in vivo motion in patients with injured cervical spines. *Spine*. **16**(suppl):S501, 1991.
- 2) Chan RC, Schweigel JF, Thompson BG. Halo-thoracic brace immobilization in 188 patients with acute cervical spine injuries. *J Neurosurg*. **58**:508, 1983.
- 3) Clark JA, Kesterton L. Halo pelvic traction appliance for spinal deformities. *J. Biomech*. **4**:589, 1971.
- 4) Cooper PR, Maravilla KR et al. Halo immobilization of cervical spine fractures: indications and results. *J Neurosurg*. **50**:603, 1979.
- 5) Danzig LA, Resnick D. The treatment of cervical spine metastasis from the prostate with a halo-cast. *Spine*. **5**:395, 1980.
- 6) Dormans JP, Criscitiello AA, Drummond DS, Davidson RS. Complications in children managed with immobilization in a halo vest. *J. Bone & Joint Surg. - Am*. **77**(9):1370-3, 1995 Sep.
- 7) Dove J, Hsu LC et al. The cervical spine after halo-pelvic traction: analysis of complications in 83 patients. *J Bone Joint Surg*. **62B**:158, 1980.
- 8) Dove J, Hsu LC et al. Spontaneous cervical spine fusion. A complication of halo-pelvic traction. *Spine*. **6**:45, 1981.
- 9) Garfin SR, Botte MJ et al. Complications in the use of the halo fixation device. *J Bone Joint Surg*. **68A**:320, 1986.
- 10) Glaser JA, Whitehill R et al. Complications associated with the halo-vest: a review of 245 cases. *J. Neurosurg*. **65**:762, 1986.
- 11) Ginsburg GM, Bassett GS. Hypoglossal nerve injury caused by halo-suspension traction. A case report. *Spine*. **23**(13):1490-3, 1998 Jul 1.
- 12) Goodman ML, Nelson PB. Brain abscess complicating the use of a halo orthosis. *Neurosurg*. **20**:27-30, 1987.
- 13) Grady M, Howard MA, Jane JA et al. Use of the Philadelphia Collar as an alternative to the halo vest in patients with C-2, C-3 fractures. *Neurosurg*. **18**:151, 1986.
- 14) Hua J, Fox RA. Magnetic resonance imaging of patients wearing a surgical traction halo. *JMRI*. **1**:264-267, 1996.
- 15) Humbyrd DE, Latimer FR et al. Brain abscess as a complication of halo traction. *Spine*. **6**:365, 1981.
- 16) Kameyama O, Ogawa K, Suga T, Nakamura T. Asymptomatic brain abscess as a complication of halo orthosis: report of a case and review of the literature. *Journal of Orthopaedic Science*. **4**(1):39-41, 1999.
- 17) Kaplan SL, Rocco TP et al. Acute pulmonary edema following removal of a spinal orthosis: an unusual complication of the halo vest. *Arch Phys Med Rehabil*. **71**:255, 1990.
- 18) Kostuick JP. Indications for the use of halo immobilization. *Clin Orthop*. **154**:46, 1981.
- 19) Levine DB, Hankin S. The halo yoke: a simplified device for attachment of the halo to a body cast. *J. Bone Joint Surgery*. **54A**:881, 1972.

- 20) Lind B, Sihlbom H. Halo-vest treatment of unstable traumatic cervical spine injuries. *Spine*. **13**:425, 1988.
- 21) Murphy MJ, Southwick WO. Complications of halo fixation. *Orthop. Trans.* **3**:126, 1979.
- 22) Pande K, Basu S, Webb JK. Transient brain injury from penetration of a halo pin. *Spinal Cord*. **36**(10):732-3, 1998 Oct.
- 23) Perry J. The halo in spinal abnormalities. *Orthop Clin. North Am.* **3**:69, 1972.
- 24) Romanelli DA, Dickman CA, Porter RW, Haynes RJ. Comparison of initial injury features in cervical spine trauma of C3-C7: predictive outcome with halo-vest management. *Journal of Spinal Disorders*. **9**(2):146-9, 1996 Apr.
- 25) Rosenblum D, Ehrlich V. Brain abscess and psychosis as a complication of a halo orthosis. *Archives of Physical Medicine & Rehabilitation*. **76**(9):865-7, 1995 Sep.
- 26) Schweigel, JF. Halo-thoracic brace management of odontoid fractures. *Spine*. **4**:192, 1979.
- 27) Victor D., Bresnan, M, *et al.* Brain abscess complicating the use of halo traction. *J. Bone Joint Surg.* **55A**: 635, 1973.
- 28) Whitehill R, Richman JA *et al.* Failure of immobilization of the cervical spine by the halo vest. *J Bone Joint Surg.* **68**:326, 1986.
- 29) Williams FH, Nelms DK, McGarahan KM. Brain abscess: a rare complication of halo usage. *Arch Phys Med & Rehab.* **73**(5):490-2, 1992 May.

Halo: Biomechanics

- 1) Koch RA, Nickel VL. The halo vest: an evaluation of motion and forces across the neck. *Spine*. **3**:103, 1978.
- 2) Krag MH, Beynon BD. A new halo vest: rationale, design, and biomechanical comparison to standard halo-vest designs. *Spine*. **13**:228, 1988.
- 3) Letts M, Kaylor D *et al.* A biomechanical analysis of halo fixation in children. *J Bone Joint Surg [Br]*. **70**:277, 1988.
- 4) Lind B, Sihlbom H, Nordwall A. Forces and motions across the neck in patients treated with halo-vest. *Spine*. **13**(2):162-7, 1988.
- 5) Mirza SK, Moquin RR, Anderson, PA, Tencer AF, Steinmann J, Varnau, D. Stabilizing Properties of the Halo Apparatus. *Spine*. **22**:727-733, 1997.
- 6) Walker PS, Lamser D, Hussey RW, Rossier AB, Farberov A, Dietz J. Forces in the halo-vest apparatus. *Spine*. **9**:773-777, 1984.

Halo: General Information, Application & Guides for Use

- 1) Garfin SR, Botte MJ *et al.* Application and maintenance of the halo skeletal fixator. *Update on Spinal Disorders*. **2**:5-8, 1987.
- 2) Mangum S, Sunderland PM. A comprehensive guide to the halo brace. Application, care, patient teaching. *AORN Journal*. **58**(3):534-46, 1993 Sep

- 3) Manthey DE. Halo traction device. *Emergency Medicine Clinics of North America*. **12**(3):771-8, 1994 Aug.
- 4) Nickel VH, Perry J *et al*. The halo: a spinal skeleton traction fixation device. *J Bone Joint Surg*. **50**:1400, 1968.
- 5) O'Brien JP, Yau ACMC *et al*. Halo-pelvic traction. *J. Bone Joint Surg*. **53B**:217, 1971.
- 6) Podolsky S, Baraff LJ, Simon RR *et al*. Efficacy of cervical Spine Immobilization Methods. *J. Trauma*. **23**:461-464, 1983.
- 7) Shellock FG. MR imaging and cervical fixation devices: evaluation of ferromagnetism, heating, and artifacts at 1.5 telsa. *Magnetic Resonance Imaging*. **14**:1093, 1996.
- 8) Sybert GW. External Spinal Orthotics. *Neurosurg*. **20**:642-649, 1987.
- 9) Thompson J. The "halo" traction apparatus – a method of external splinting of the cervical spine after injury. *J Bone Joint Surg*. **44B**:655, 1962.
- 10) Triggs KJ, Ballock RT, Byrne T, Garfin SR. Length dependence of a halo orthosis on cervical immobilization. *Journal of Spinal Disorders*. **6**(1):34-7, 1993 Feb
- 11) Wang GJ, Moskal JT *et al*. The effect of halo vest length on stability of the cervical spine. *J Bone Joint Surg*. **70**:357, 1988.
- 12) Wetzel FT, Dunsieith NW Jr, Kuhlengel KR, Paul EM, Lahey DM. The effectiveness of the cervical halo: open versus closed ring. A preliminary report. *Paraplegia*. **33**(2):110-5, 1995 Feb.

Halo: Magnetic Resonance Imaging Safety

- 1) American College of Radiology. MRI monograph: safety and sedation. Reston, VA: American College of Radiology, 1996
- 2) American College of Radiology. American College of Radiology standard for performing and interpreting magnetic resonance imaging (MRI). Reston, VA: American College of Radiology, 2000
- 3) *Clinical Testing of Ceramic-Tipped Halo Pins in the MRI: Human Research Project Summary*; St. Joseph's Hospital/BNI IRB, Phoenix, Sept., 2004
- 4) Connelly GC, Tweardy LA. *Ceramic Skull Pins as Electrical Insulators to Prevent Patient Burning*; October, 2001; Jerome Internal Control Document
- 5) Connelly GC, Tweardy LA. Mechanical Testing of Ceramic-tipped Skull Pins; Nov., 2003; Jerome Internal Control Document
- 6) Connelly GC, Tweardy LA, Nemeth JA, Kim LA. Maximum Pin Loads during Manual Reduction Maneuvers: The Distraction/Flexion/Rotation Procedure; Nov. 2003; Jerome Internal Control Document
- 7) Dempsey MF, Condon B, Hadley DM. Investigation of the Factors Responsible for Burns During MRI; *J Magn Resonance Imaging*; 13:627-631; 2001
- 8) ECRI hazard report: patient death illustrates the importance of adhering to safety precautions in magnetic resonance environments. *Health Devices* 2001;30:311–314

- 9) Hott JT, Kim LJ, Nemeth JA, Tweardy LA. *Novel Glass Composite Halo Ring Eliminates MRI Artifact: Initial Experience; CNS Proceedings*; Philadelphia, 2002
- 10) Kanal E. Website Correspondence; UPMC Health System Magnetic Resonance Safety Site (<http://kanal.arad.upmc.edu/mrsafety.html>); Mar., 1996
- 11) Kanal E, Borgstede JP, Barkovich AJ et al. ACR White Paper on Magnetic Resonance (MR) Safety; *AJR* 2002; 178:1335 – 1347.
- 12) Kanal E, Borgstede JP, Barkovich AJ et al. ACR White Paper on Magnetic Resonance (MR) Safety: 2004 Update and Revisions; *AJR*, May 2004, 182:1111-1114.
- 13) Kanal E, Shellock FG. SMRI Safety Committee. Policies, guidelines, and recommendations for MR imaging safety and patient management. *J Magn Reson Imaging* 1992;2:247–248
- 14) Kim LJ, Hott JT, Nemeth JA, Tweardy LA, Horn EM, Feiz-Erfan I, Bristol RE, Klopfenstein JD, Lekovic, GP, Sonntag VKH. *Prospective Analysis of Ceramic Skull Pins for Halo Vest Fixation to Prevent Pin-Heating Phenomenon during MRI*; CNS Proceedings, Philadelphia, 2002
- 15) Kim LJ, Sonntag VKH, Hott JT, Nemeth JA, Klopfenstein JD, Tweardy LA. *Halo Pin-related Scalp Burn Following Magnetic Resonance Imaging: Case Report*; unpublished draft.
- 16) Kim LJ, Sonntag VKH, Hott JT, Nemeth JA, Klopfenstein JD, Tweardy LA. *Scalp burns from halo pins following magnetic resonance imaging: Case Illustration*; *J Neurosurg*; Vol. 99; 186; July, 2003
- 17) Nemeth JA, Tweardy LA. “*Pin Heating Phenomena*” with Use of Halo Fixation in the MRI; ;Thranhardt Lecture Award; Proceedings of AOPA; Washington, DC; 2000
- 18) Obst S.; Test Procedure: ASTM Designation F 1831-97, Section 11; Nov., 2003; Jerome Internal Control Document
- 19) Saari A, Runciman RJ, Hayward G. Modelling the bioelectric behaviour of halo pin-patient structures during magnetic resonance imaging; *Proc. Instn Mech Engrs*; Vol. 218, Part H; *J Engineering in Medicine*, Feb., 2004
- 20) Shellock FG. MR imaging and cervical fixation devices: evaluation of ferromagnetism, heating, and artifacts at 1.5 telsa. *Magnetic Resonance Imaging*. **14**:1093, 1996.
- 21) Shellock FG. *Pocket guide to MR procedures and metallic objects: update 2001*. Philadelphia, PA: Lippincott Williams & Wilkins Healthcare, 2001:147–148
- 22) Shellock FG, Crues JV. Comments on the ACR White Paper on Magnetic Resonance (MR) Safety; Internet Posting; July, 2002
- 23) Shellock FG, Kanal E. SMRI Safety Committee. Guidelines and recommendations for MR imaging safety and patient management. III. Questionnaire for screening patients before MR procedures. *J Magn Reson Imaging* 1994;4:749–751
- 24) Shellock FG, Kanal E. SMRI Safety Committee. Policies, guidelines, and recommendations for MR imaging safety and patient management. *J Magn Reson Imaging* 1991;1:97–101
- 25) Zieberg AS. *Halo MR Comparison*; Jan, 2004; Jerome Internal Control Document
- 26) Zeiberg AS. Halo Ring MRI Phantom Comparison; Sept., 2002; Jerome Internal Control Document