

自制框架内固定治疗脊柱骨折并截瘫的评价

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摘要 本文通过对自制框架结构内固定治疗 12 例胸腰椎骨折脱位并脊髓损伤病人的结果分析, 认为框架结构具有独特的生物力学特性, 其抗旋转及侧弯能力优于 Harrington 棒, “ \cap ”形棒及 Luque 棒, 但纵向撑开力不及 Harrington 棒及 Dick 固定器。由于其为多节段固定, 术后较为牢固, 比较适用于无或轻度 ($I^{\circ} \sim II^{\circ}$) 椎体压缩的胸腰椎骨折脱位及下腰椎不稳定。文内对框架结构内固定的优缺点进行了评价。

关键词 框架结构 内固定 脊柱脊髓损伤

胸腰段脊柱骨折脱位合并脊髓或马尾神经损伤是脊柱损伤中最常见的疾病之一, 多年来人们采取了各种各样的固定方法, 但或多或少都有不同程度的并发症^[1,2]。我院自 1990 年 11 月~1993 年 6 月采取后路切开复位, 椎管前后方减压加框架结构内固定治疗 12 例胸腰段脊柱骨折, 取得了一定的效果。本文旨在对该法的优缺点作一分析评价。

临床资料

本组 12 例中, 男 9 例, 女 3 例; 年龄 27~60 岁。致伤原因: 高处坠落伤 9 例, 胸背部重物砸伤 3 例。12 例均有不同程度的前后方脱位或侧方脱位, 椎体压缩 $I^{\circ} \sim II^{\circ}$ 9 例, $III^{\circ} \sim IV^{\circ}$ 3 例。后凸成角畸形: $5^{\circ} \sim 10^{\circ}$ 4 例, $11^{\circ} \sim 20^{\circ}$ 5 例, 20° 以上 3 例。神经功能损伤按 Frankel 分级: A 级 4 例, B 级 3 例, C 级 3 例, D 级 2 例。合并有肱骨中段骨折、颅脑损伤 II 级, 跟骨骨折各 1 例, 休克 1 例。受伤至入院时间: 1 小时~15 天, 平均 4.8 天, 受伤至手术时间: 5 天~23 天, 平均 8 天。

手术方法

将直径为 5mm 的钛合金棒、Luque 棒或 Ender 针折弯成框架结构, 连结处行焊接, 并据骨折部位及术前 X 线平片测量制成相应长、宽度及弧度, 一般长约 14~20cm, 宽约 2~2.5cm。直径 1~1.2mm 的钢丝备用。

全麻或硬膜外麻醉, 患者取俯卧位, 以损伤脊柱为中心行后正中切口, 切开皮肤。皮下

向两侧剥离骶棘肌至小关节水平, 用自动拉钩固定, 充分暴露术野, 上、下各显露 2~3 个脊柱的棘突、椎板, 据术前 CT 及 X 线检查情况, 术中行牵引复位, 若伤椎椎体骨折仍突向椎管者, 则行椎体前推 (打击) 或碎骨片取出, 后方椎板切除减压, 至探查椎管上、下方均通畅, 脊髓无受压为止。再分别于上、下各 2~3 节处切除棘上和棘间韧带, 在棘间推开硬膜外脂肪层, 椎管的穹窿部引入备用的节段钢丝, 如此分别于损伤椎上下各引入 2~3 对 (每处均为双股钢丝), 然后安放框架, 拧紧钢丝, 分别行节段性固定 (如图所示)。

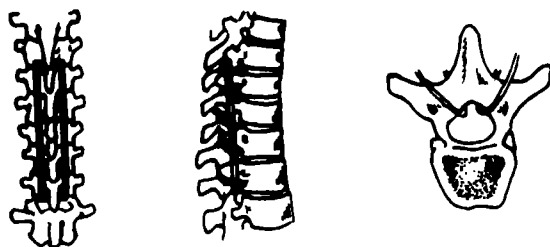


图 框架固定正侧位及椎板下穿钢丝示意

治疗结果

12 例术后均行 X 检查, 前后移位及侧方移位均完全恢复, 椎体压缩不同程度恢复, 后凸成角畸形亦大部分纠正。随访 1.5~4 年, 框架无滑脱, 钢丝无断裂, 椎体脱位未见复发, 后凸成角畸形 2 例有轻度加重。神经功能恢复情况: A 级 4 例无明显变化; B 级 3 例中进步到 C 级 1 例, 进到 D 级 2 例; C 级 3 例中 1 例无变

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化, 2 例恢复正常; D 级 2 例均恢复正常。

讨 论

框架结构的生物力学特性 Luque 节段内固定系统已被广泛应用于纠正脊柱畸形和稳定脊柱的手术中, 框架结构系改良的 Luque 固定器, 李振宇等^[3]将 Luque 棒改良成“∩”形棒, 其通过力学测定发现, 在小变形范围内“∩”形棒与 Harrington 棒的固定作用基本相同。在侧弯状态下“∩”形棒所承受的应力比 Harrington 棒小得多, 而固定后断面上“∩”形棒所承受的压应力比 Harrington 棒压应力大。扭转试验表明“∩”形棒的抗扭转能力比 Harrington 棒大 35.2%, 三点弯曲试验“∩”形棒的最大垂直位移小于 Harrington 棒。而黄琪裳等^[4]则将与本文相同的内固定方式进行与“∩”形棒及 Harrington 棒比较, 在不同载荷下, 框架结构抗扭转能力比“∩”形棒大 24%, 比 Harrington 棒大 53%。三种内固定应力值测试, 在前屈试验时, 其应力值差别不大, 但在侧弯状态时, 框架结构直梁上所承受的应力比“∩”形棒小, 比 Harrington 棒小得多。Fidler^[5]等的实验研究也表明, 服贴的框架结构比起分开的纵形植入物, 如 Harrington 棒, Luque 棒更能有效地控制旋转, 只不过 Fidler 等所用的框架结构将上、下横梁折弯成 100°角的蓬顶状。

框架结构内固定的适应症与评价 框架结构固定器系后路固定方式, 较之前路手术简单、安全。通过本组及他人^[3~5]治疗结果分析发现它具有下列优点: (1) 正是其所具有的生物力学特性, 术后固定较为牢固, 不需要加用外固定, 可以使患者早期活动, 减少皮肤、肺部及泌尿系的各种并发症, 有利于神经功能恢复及骨折愈合; (2) 取材及制作方便, 若无专门的钛合金棒时, 可用 Ender 针及其他不锈钢棒折弯并焊接即可, 并可据脊柱的生理曲度及骨

折之脊柱的 X 线测量制成不同的长、宽及弧度的框架结构; (3) 手术操作较简单且安全, 仅在钢丝引入时注意勿伤脊髓, 只要将钢丝折弯以圆头引入一般不会损伤脊髓 (见示意图); (4) 各种并发症亦较 Harrington 棒、Dick 固定器等为少^[1,2], 本组随访无框架结构滑脱及钢丝断裂现象。

框架结构固定器亦有不利的问题, 手术范围较 Dick 固定器, Steffee 钢板等短固定器暴露为广泛, 术中出血较多, 脊柱脱位及成角畸形的矫正主要依靠术中台下辅助牵引, 手术台角度调节及利用手术器械行骨折处撬、拔、打击, 其纵向撑开力远不及 Harrington 棒、Dick 固定器、Steffee 钢板等, 故对脊柱前后及侧方脱位纠正较为理想, 而对椎体压缩及后凸成角畸形纠正有时难以如愿。我们体会框架结构内固定的理想适应症应为, 无或轻度 (I°~II°) 椎体压缩的胸腰椎骨折脱位及下腰椎不稳定^[6]。当然, 对于椎体压缩严重者若能在牵引及器械帮助下达到良好复位时, 框架结构亦是一种较理想的后路内固定器械。

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Abstract of Original Articles

Treatment of Acute Fascial Compartment Syndrome

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The delayed treatment of the acute fascial compartment syndrome can produce disability of the limbs and even dangerous to the life. The conservative treatment can be applied to the moderate—mild patients, such as closely observing the patient's condition, immobilizing and elevating the illed limb, and applying 20% mannitol for dehydration, as early as possible. As there is no effect in the conservative treatment and the syndrome is serious, you must be not delay to apply the surgical operation. The only effective method is thorough decompression and excision of the necrotic tissue. The selective decompression, primary open reduction and internal fixation, and relief skin grafting are feasible.

Key Words Fascial compartment syndrome Close observation Decompression Mannitol

(Original article on page 3)

Evaluation of Treatment on Spine Fracture Combined with Paraplegia with Self—made Frame for Internal Fixation

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After analysis of the therapeutic effect of thoracic and lumbar fracture and dislocation combined with spinal cord injury in 12 cases with self—made internal fixation frame, it was considered that the structure of frame has a unique characteristics of biomechanism: the ability of its anti rotation and anti—lateral bending are better than Harrington's rod, "∩" formed rod, and Luque rod, but its longitudinal opening force is less than that of Harrington's rod and Dick's fixator. It is much firmer due to its multiple segmental fixation, and more suitable for thoracic and lumbar vertebral fracture and dislocation without or with I°—II° vertebral compression, and instability of lower lumbar vertebrae. The advantages and drawbacks of the frame structure were evaluated.

Key Words Structure of frame Internal fixation Injury of spine and spinal cord

(Original article on page 6)

Two Factors Analysis about the Influence of Repairing Approaches for Bone Trauma on Serum Copper

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Experimental defect of rabbit's mandible was created and repaired with three different approaches. Serum copper was detected by atomic absorption spectrophotometry to explore the metabolism of trace element copper during the repair of defect. The results indicated that the changes of serum copper are different due to different approaches. There are statistical significance in the changes of the different time—points in different approaches. It was suggested that there is significance in supplement of copper in adequate amount, while zinc is supplied in clinic.

Key Words Bone trauma Repairing approach Repairing time Serum copper Two factors analysis

(Original article on page 8)

Biomechanical Studies on Internal Fixation with One Thick and One Thin Lag Screws for Femoral Neck Fracture

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There are various kinds of internal fixation for femoral neck fracture. One thick and one thin lag screws were drilled into femoral neck and the biomechanical properties were studied in this work. After applying 50 kg of loading in abduction, adduction and natural position, the distributions of stresses in femoral neck were measured with advanced resistance strainometer. The results indicated that the tensile stress and compressive stress beared by such two screws are superior to that by other forms of fixation.

Key Words Fracture of femoral neck Internal fixation Biomechanics