A new self-drilling skull traction device with flexion-extension modification

Technical note

WILLIAM L. CATON III, M.D., MILTON D. HEIFETZ, M.D., RICHARD B. SMALL, M.D., AND THEODORE KURZE, M.D.

Department of Neurological Surgery, University of Southern California School of Medicine, and Cedars-Sinai Medical Center, Los Angeles, California

A new tong has been designed that can be attached to the skull using the three-prong principle. It may act as a rigid integral part of the skull, or may simply swivel in the same manner as all contemporary tongs. This ability to function as a rigid attachment allows for flexion or extension of the patient’s neck if indicated. The need for incisions or extra drills has been eliminated.

KEY WORDS - skull tong - cervical traction - three-prong clamp - bolt-drill - cervical spine

The need to maintain a constant position of the patient’s head and neck in flexion or extension is sometimes of utmost importance in the reduction of a fracture of the cervical spine. These positions cannot be easily controlled by the currently available tongs which have a tendency to swivel in the skull. A new skull device has been designed,* which can eliminate this swiveling tendency. This new design provides secure insertion of the tongs into the skull without the use of separate drills, guards, or incisions. It allows an angle of insertion that decreases the possibility of the tongs becoming dislodged.

Description of the Instrument

The device is composed of a rigid stainless steel arc with three self-drilling bolt-drills for positive skull fixation (Fig. 1). The tendency of other tongs to swivel or act as a hinge is eliminated by the three-prong principle used in this device. When it is inserted into and through the outer table, the traction device becomes an integral part of the head of the patient. The design of the bolt-drills makes possible this firm attachment to the skull. The point of the drill has been combined with a fine-threaded bolt to produce a slow forward thrust. This combination enables the physician to drill into the skull with simple hand rotation of the bolt-drill. As in the Gardner tongs, the need for separate incisions and a separate drill is eliminated. The bolt-drill is quite safe, it cannot penetrate deeper than the operator desires. The depth is controlled by 2-mm increments marked on the side of the bolt-drill, and once the correct depth is reached, the bolt-drill is locked in place by lock bolts.

The optimum angle of insertion was determined to be perpendicular to the plane of traction rather than at an angle; this is the same plane used by the Vinke and Blackburn skull devices. If the prong is inserted along the lateral aspect of the calvaria, rather than over the more convex section, there is greater and more reliable holding power. Figure 2 shows that a tong applied high on the calvaria has the least amount of support from the bone, while the tongs inserted at a lower level, such as this new device, have greater support.1-4

Technique of Application

The tongs are autoclaved, the area of the scalp to be penetrated is cleansed, and local anesthetic is injected.

*Skull traction device designed by Milton D. Heifetz, M.D., is manufactured and distributed by Codman and Shurtleff, Randolph, Massachusetts.
The arc containing the three bolt-drills is placed in an approximate position below the parietal fossa. The sharply pointed bitemporal bolt-drills are advanced into the scalp until they firmly impinge upon the skull, the millimeter markings are then noted. The temporal bolt-drills are advanced into the skull alternately in the following manner: one bolt-drill is advanced by turning it clockwise three complete revolutions (watch the incised line of the bolt-drill knob). The same bolt-drill is then retreated by unscrewing it two complete revolutions. The opposite temporal bolt-drill is then advanced three turns, and retreated two turns. This maneuver is continued alternating the temporal bolt-drills until each has penetrated the outer table by 2 or 3 mm.

When insertion is completed, the bolt-drill is rotated so that the flat edge of the bolt (containing the 2-mm lines) is facing toward the patient's feet. The lock bolts at the ends of the arc (Fig. 1) are then tightened, thereby locking the bitemporal bolt-drills in place.

Fig. 1. Photograph of the Heifetz self-drilling skull traction device with three prongs in place.

Fig. 2. Artist's drawing of a skull showing the action of various tongs. a: Amount of bone necessary to avulse in order to pull out the Heifetz tongs. b: Direction of tips of Crutchfield type tongs. c: Direction of tips of Vinke, Blackburn, and Heifetz tongs. d: Vinke and Blackburn tongs are more secure than this new device since they penetrate the total thickness of the skull to point d on the diagram.
They cannot be rotated until the lock bolts are released.

**Discussion**

We have found this new tong device to be of great value in the management of patients with various unstable neck injuries. We have employed it in six patients with different levels of injury for periods of up to 8 weeks. It was especially valuable in one case for the reduction of a C3-4 fracture-subluxation with bilaterally locked facets. If a vector force including rotation, lateral tilt, and traction is applied and maintained until the facets are unlocked, it is possible, by removing the traction force and eliminating the lateral tilt force, while maintaining the rotation force, to drop the facet back into the proper position. This was done on this patient with excellent results, due to the adaptability of this new device with the three prongs in place. A total weight of 80 lb had been placed on this patient before the maneuver. The skull tongs held firm without any difficulties.

The adaptability and easy use of the new traction device has improved the management of severe neck injuries. Its ready placement without incision, its strong holding power, and the adaptability of the three bolt-drills allows a versatility not previously available. In each of the six patients upon whom we have used it so far, reduction of injury was readily facilitated and maintained. On this basis, we consider this new instrument to be a valuable adjunct in management of patients with cervical fracture-subluxations and the reduction of locked facets.

**References**


 Address reprint requests to: William L. Caton III, M.D., Department of Neurological Surgery, Medical Center, 624 West Duarte Road, Arcadia, California 91006.