



## STABILIZATION OF THE CERVICAL SPINE USING THE ALLIGATOR PLATE SYSTEM

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I have designed a type of clamping plate called the "Alligator plate" for stabilization of the cervical spine and used it in some clinical cases with cervical instability. Various types of instrumentation to fix the unstable cervical spine such as screw and plate, hook, hook and rod system, subliminal wiring or simple wire suturing have been reported. Each posterior fixation method has its advantages and disadvantages. Although interspinous wiring is an easy, safe and simple technique, this method cannot promise cervical stability, especially in extension or rotation. Screw and plate is a rigid fixation and both decompression and fusion can be performed through only one approach. but lateral mass screwing or pedicle screwing require a complicated technique and has the risk of inadequate screw insertion. Subliminal wiring offers rigid fixation and it is available for occipito-cervical fusion, but this method is risky in case with cervical canal stenosis and also requires a complicated technique.

The Alligator plate was designed by myself, made by Mizuho Ikkogyo. Alligator plate has a physiological lordotic curve. The "L"-shaped cut surface gives strength in all directions and the length of the plate is adjustable by cutting. Multiple triangular spikes clamp the base of the spinous processes of the cervical spine and multiple notches outside the plate prevent the loose-

ning of the wires, which encircle and fix the plate. Only one size of Alligator plate and some wires or suture threads are all implants needed. Alligator plate system cannot be used for post-laminectomized instability because the plate clamp the base of the spinous process. However, Alligator plate is a simple instrument and its fixing technique is easy.

**Operative techniques:** The Alligator plate is cut by pin cutter to fit the fusion length. A pair of wires is inserted into each interspinous space at the fusion levels and one level below. After checking the alignment of the cervical spine by a lateral radiograph, the bases of the spinous processes of the cervical spine are clamped between the multiple spikes of the Alligator plate. The wires are tightened so as to press that plate against the spinous processes using wire tightener from cranial to caudal. After alligator plate fixation, the posterior surface of the laminae and the facet joints of the fusion segments are decorticated using by an air drill. A sufficient amount of graft bone can be placed on both sides of the iliac bone because the Alligator plate does not take up space.

**Clinical experiences:** Fifty-one patients with cervical instability treated by posterior cervical instrumentation using the Alligator plate were radiological evaluated. There were 37 males and 14 females. The average age was 39.8 ye-

ars ranged from 12 to 82 years. Follow up duration was more than one year averaged in two year and seven months. Diagnosis causing cervical instability was trauma in 30 cases, myelopathy due to kyphosis in 4, non-union after anterior fusion in 4, spinal tumor in 3, pyogenic spondylitis in 3, rheumatoid arthritis in 3, myelopathy associated with athetoid cerebral palsy in 2, kyphosis in one and destructive spondyloarthropathy associated with HD in one. Alligator plate fixation was carried out for nonunion after anterior spinal fusion in 4 cases, in combination with anterior fusion in 17 and with posterior bone grafting in 30. Depending on the dynamic flexion-extension lateral radiograph and confirmation of the fusion mass in an oblique view radiograph, surgical results were evaluated as follows: Excellent: union in the alignment at the operation; good: union with minimal displacement; poor: non-union, dislodgement of the anterior grafted bone or instrumentation failure.

**Results:** In patients undergoing surgery for non-union after anterior spinal fusion, the results were excellent in all cases. Alligator plate fixation without bone grafting is enough for achieving the union of the non-union site. When the alligator plate was applied in combination with anterior spinal fusion, the clinical result were excellent in 15 cases, good in 2 and poor in none. In the group with the Alligator plate applied for posterior spinal fusion with posterior bone grafting, we achieved an excellent in 27 cases, good in 1 and poor result in 2. The overall result was excellent in 46 cases, good in 3 and poor in 2.

Dislocation of the cervical spine can be treated by Alligator plate fixation with posterior bone grafting in case without disc herniation. Burst fracture of the cervical vertebral body is good indication of this method. Anterior decompression with strut bone graft in combination with posterior spinal fusion using the Alligator plate system is suitable for myelopathy associated with athetoid cerebral palsy. In case with vertebral tumor, anterior decompression and fusion can be done followed by alligator plate fixation with bone cement. Fracture of the spinous process occurred in both poor cases due to severe osteoporosis. Ankylosis at the adjacent facets of the fusion segments was seen in two patients and wound infection occurred in another two patients as complications.

Alligator plate fixation has some disadvantages, but it is useful for cervical fixation with some features as follows: The "L"-shaped cut surface gives strength in all directions. Multiple triangular spikes clamp the base of the spinous process of the cervical spine. Multiple notches prevent the loosening of the wires. The length of the plate is adjustable by cutting. Special technique or instrument is not necessary for setting Alligator plate. This technique gives more stability in extension, flexion or rotation of the cervical spine than wire suturing method.