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Management of Mandibular Fractures by An Inexpensive Compressive Reduction Technique

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Abstract **The author describes an inexpensive technique by simple rigid interosseous fixation for the management of mandibular fractures. This technique, to be referred as Nakornpathom technique, is cheap, easy, and needs no expensive plates and screws. It needs simpler and cheaper miniplate and steel wires to achieve rigid compression osteosynthesis. There were 127 mandibular fractures in 100 patients treated by this technique at the Nakornpathom Hospital between January 1997 and April 1999. All cases successfully healed, but with very few minor complications. The technique developed at Nakornpathom Hospital provides a reasonable alternative of internal rigid fixation for the management of mandibular fractures. It is suggested that the technique is appropriate to all developing countries especially during the situation of economic crisis.**

Concerning the open reduction and internal fixation of mandibular fracture treatment, the rigid compression plate fixation is a standard procedure.[1-4] Manson PN[1] summarized it as a dynamic compression plate at lower border of mandible, the possible distraction deformity at the dental site of fracture are corrected either by another dynamic compression plate (tension band plate, Figure 1A) or arch bar (tension band arch bar, Figure 1B)

We have no compression plates available in maxillofacial service at Nakornpathom Hospital due to economic problem. So the compression plate osteosynthesis either for rigid osseous fixation or for tension band effect is impossible. The main causes of mandibular fractures in Thailand are traffic accidents and assaults. Many patients who sustained maxillofacial injuries lost their teeth or the teeth were unstable rendering the use of tension band arch bar fixation seems impossible. The author tried to achieve rigid compression osteosynthesis principle by using prefabricated compressive reduction with a tension band interosseous wiring plus miniplate fixation at the lower border of the mandible. The possible distraction deformity was then corrected with a tension band interosseous wiring over two one-cortex screws.

Patients And Methods

The technique utilized at Nakornpathom Hospital (Nakornpathom technique)for management of mandibular fractures was performed in 100 patients with 127 fractured sites of the mandible between

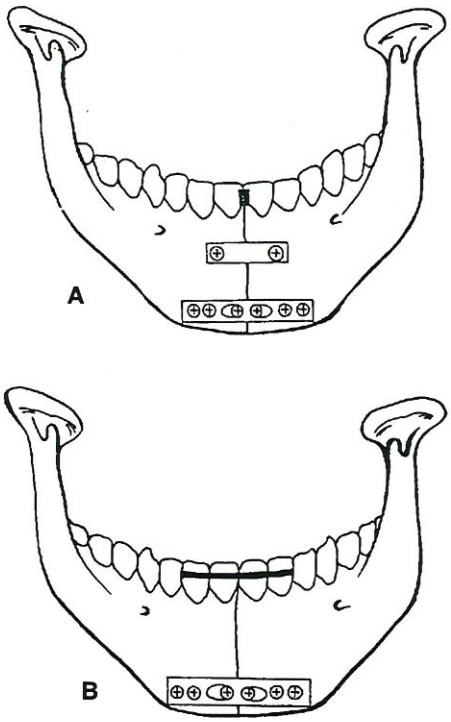

Fig. 1 A dynamic compression plate at lower border of the mandible and a dynamic compression plate (tension band plate) for correction of distraction deformity at dental site (A) or tension band arch bar (B).

January 1997 and April 1999. Ninety four per cent of the patients were males, the mean age was 29 years with an age range of 14-64 years. The clinical data was recorded on a protocol form. The preoperative assessment including age, gender, mechanism, site, number of fractures, dentition, status of teeth in the fracture site, nerve function associated injuries were recorded. The postoperative evaluation including hospital stay, operative cost, malocclusion, infection, wound dehiscence, nonunion and nerve function were all recorded. All patients received general anesthesia for operative fixation of their mandibular fractures with preoperative antibiotics given routinely. All cases were followed-up three months postoperatively. The isolated condylar fractures were excluded from this study because the author treated these fractures conservatively.

Operative Technique

1. The intermaxillary fixation (IMF) for aiding occlusal registration was performed and maintained postoperatively for two weeks.

2. Prefabricated compressive reduction with an interosseous wiring at the lower border of the mandible (Figure 2)

3. A miniplate fixation adjacent to the prefabricated one (Figure 3)

4. The probable distraction deformity at dental site of mandible were corrected by another tension band interosseous wiring over two one-cortex screws (Figure 4). The author drilled one-cortex screws to

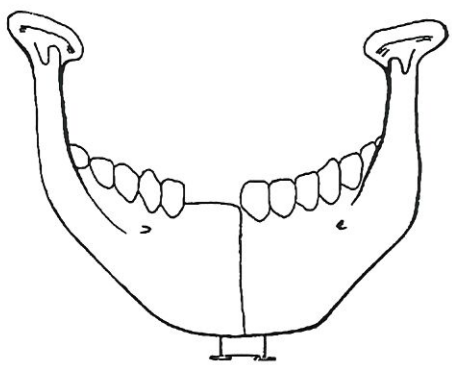

Fig. 2 The prefabricated compressive reduction with an interosseous wiring over two screws.

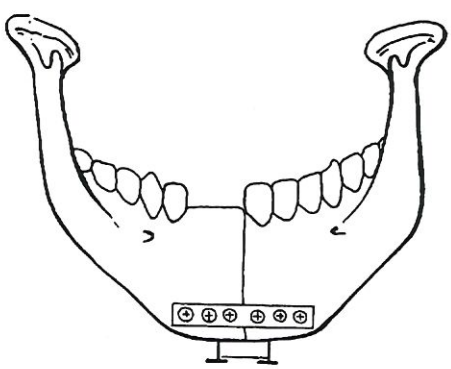

Fig. 3 A miniplate fixation.

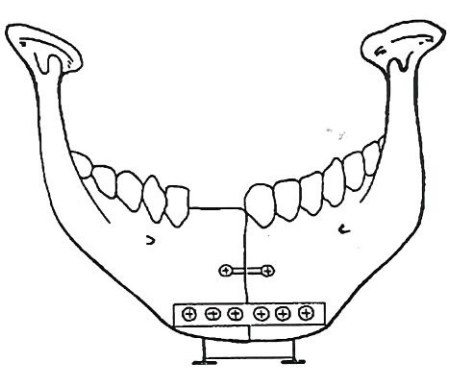

Fig. 4 The tension band interosseous wiring over two one- cortex screws.

avoid dental roots jeopardy.

Results

The etiologies of mandibular fractures were divided into three categories. Seventy one per cent was traffic accidents, 25 per cent was assaults, and 4 per cent was falling. The sites of mandibular fractures were distributed as, 47 symphyseal fractures (37%), 50 parasymphyseal (39%), 18 body fractures (14%) and 12 angle fractures (9%). Eighty two per cent of the patients were edentulous, partial edentulous or teeth at the fractured sites were unstable. Postoperative complications of malocclusion, infection, delayed union, nerve disorder, wound dehiscence were presented in Table 1. Eighty eight per cent of patients had their fractures healed satisfactorily with proper occlusion and without any complications. There were three cases (3%) of minimal malocclusions which required corrective occlusal adjustment. Soft tissue infection was seen in 2 per cent of the patients and required systemic antibiotics and topical wound management. Wound dehiscence occurred in 4 per cent of the patients at parasymphyseal sites from lower

Table 1 Comparison of results with other miniplate studies (in % of patients).

Study	Year	n	Malocclusion	Infection	Dehiscence	Delayed union	Nerve disorders
Champy[10]	1986	467	4.8	3.8	3.9	0.5	-
Ikemura[11]	1988	66	3	0	-	-	-
Sung[12]	1988	26	-	3	0	-	-
Rix[13]	1991	80	2.66	0	2.6	1.3	2.6
Renton[14]	1996	123	9	9.5	5	8.5	-
Boonyawatana	1999	100	3	2	2	0	5

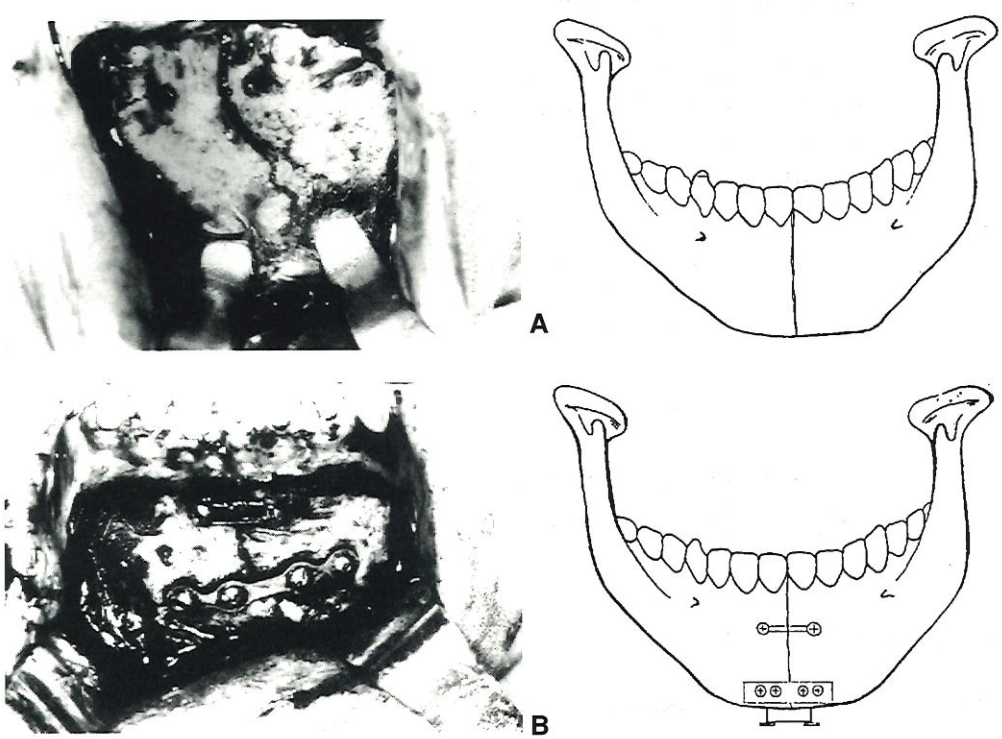

Fig. 5 A. Photograph of a fracture at symphysis of mandible with drawing to illustrate the site of fracture.
B. Photograph and drawing of the fracture treated with fixation by the Nakornpathom technique.

gingivobuccal unapporximated sutures. They were corrected by secondary sutures. Delayed union which was defined as excessive mobittity of the fracture sites 4 weeks post-treatment did not occurred. Nerve disorders occured in 5% of the patients. There were 2 cases of marginal mandibular branch of facial nerve neurapraxia and 3 cases of mental nerve neurapraxia. All 5 cases recovered within 6 weeks of conservative treatment. The mean cost of operation was 9711 Bahts with range of 6,000-18,368 Bahts. The mean hospital stay was 3.4 days with range of 2-14 days.

Cases presentation

Case 1

A 24-year-old man sustained a symphyseal mandibular fracture from a motorcycle accident. The teeth at the fracture site were unstable, so the conventional tension band arch bar seemed impossible. The Nakornpathom technique was performed (Figure 5). The distraction deformity was corrected by a tension band interosseous wiring over two one-cortex screws (2 mm. diameter, 8 mm. long). The author successfully achieved anatomical reduction, good fracture healing, proper occlusion and without complications.

Case 2

A 38-year-old man suffered from open fracture at right angle of the mandible. The conventional procedure to correct distraction deformity in this patient should be another small dynamic compression plate. Since the hospital had no dynamic compression plate, the Nakornpathom technique was applied to correct this problem by a tension band interosseous wiring over two one-cortex screws adjacent to dental roots (Figure 6). The fracture healed with good occlusion. There was neurapraxia of marginal mandibular branch of facial nerve, but complete recovery occurred in 3 weeks postoperatively with conservative treatment.

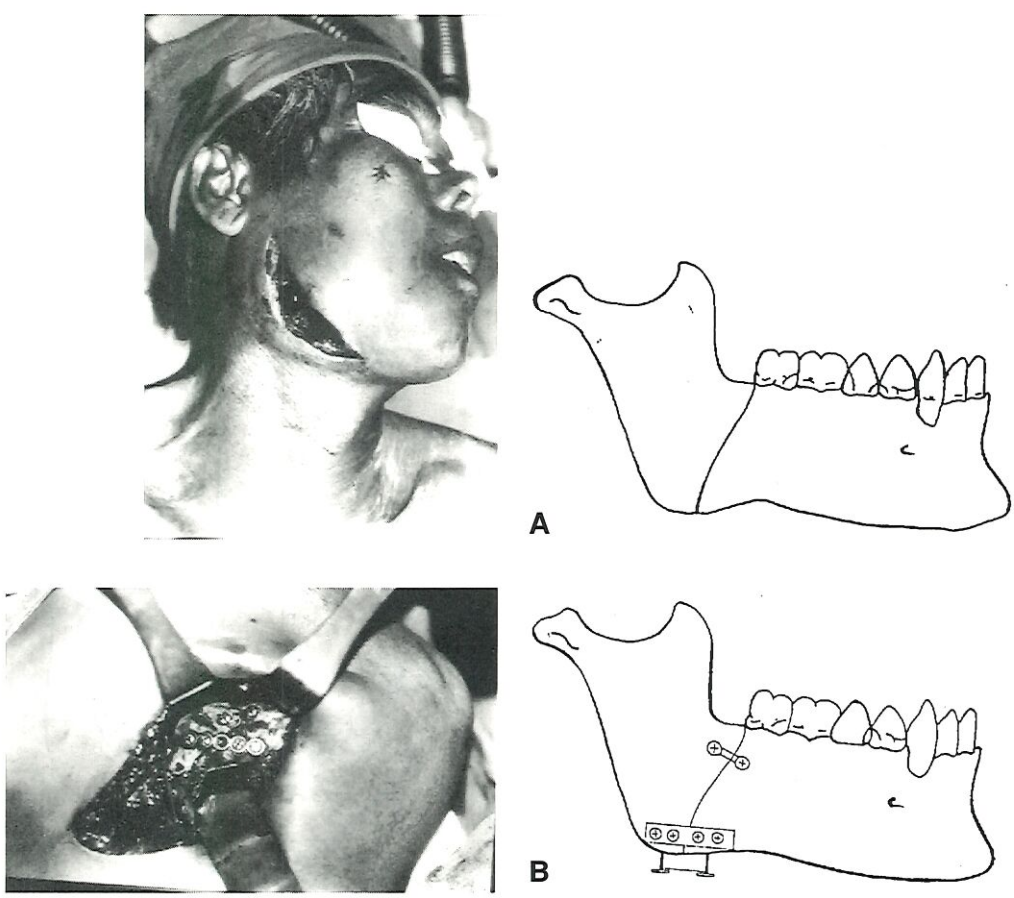

Fig. 6 A. Photograph and drawing to illustrate the fracture at the right angle of mandible in Case 2.
B. Photograph and drawing to illustrate the result of fixation by the Nakornpathom technique.

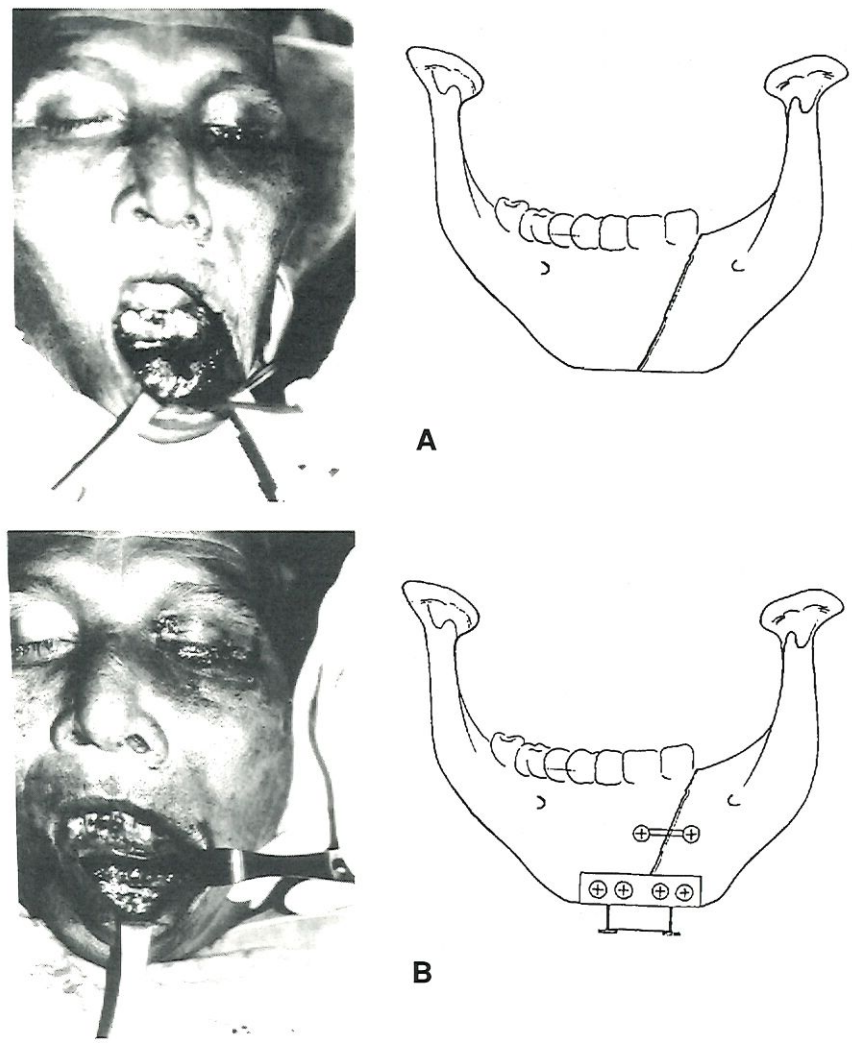

Fig. 7 A. Photograph and drawing to illustrate the oblique fracture on left parasymphysis of mandible. This patient had problems of partial edentulous and unstable teeth.
B. Photograph and drawing of the treated fracture by the Nakornpathom fixation technique.

Case 3

A 41-years-old man was referred to the hospital with a fracture at left parasymphysis of the mandible. The patient had a problem of extracted teeth and unstable teeth. The Nakornpathom technique was performed and the problem was solved (Figure 7). The result was satisfactory.

Discussion

Internal plate osteosynthesis is currently the preferred method of osseous fixation by many surgeons in the management of mandibular fractures. Reduction and fixation can be provided by so-called compression plates[1-4]. Manson[5] formulated a standard principle of mandibular fracture treatment by compression plates that a dynamic compression plate at the lower border of the mandible and the possible distraction deformity at the dental site of the mandible should be corrected by tension band effect with either another dynamic compression plate (tension band plate) or an arch bar (tension band arch bar).

In order to reach the goals of compression plate rigid osseous fixation, the author used miniplates and wires as osteosynthesis materials. Recently, many surgeons reported that non-compressiver miniplates were more extensively used[1,7,8], Because their sizes and adaptability facilitated their transoral application. Valentino, Levy and Moretette[6] proposed monocortical miniplate fixation as a reliable method of providing

rigid fixation and offered it as a reasonable alternative to bicortical compressive plating in most mandibular fracture. So the author imitated the rigid compression plate at the lower border of the mandible with a prefabricated compressive tension band interosseous wiring plus a miniplate fixation. Again, with the problem of unavailable compression plate, how can the distraction deformity at dental site of the mandible be corrected? Eventhough we can solve this problem with a tension band arch bar, if the patients lost their teeth or the teeth were unstable, the tension band arch bar seemed impossible. What is the answer for correction of distraction deformity in all settings? The author used a tension band interosseous wiring over two one-cortex screws to solve those problems. All cases of mandibular fractures treated by Nakornpathom technique healed satisfactorily with good union, proper occlusion, and with only few cases of minor complications. The main advantage of this technique is appropriate to Thailand's current economic status.

As far as the cost of internal osseous fixation of mandibular fracture was concerned, Brown[15] revealed the overall cost per patient was at £ 794 (Baht 47,640 at £ 1 equals to Baht 60) compared to Baht 9711 of Nakornpathom technique. The technique needs uncomplicated equipment, so it can be used in any other general hospitals, and may be appropriate for application in other developing countries.

Conclusion

The Nakornpathom technique for the management of mandibular fractures provides satisfactory results. This simplified technique should be an alternative of the rigid internal osseous fixation. As it is simple and inexpensive, it is recommended not only for Thailand, especially in the situation of economic crisis, but also for all other developing countries.

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