Surgical Treatment of Le Fort Fractures in Ban Pong Hospital: Two Decades of Experience

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Abstract

A retrospective study of 64 patients with maxillary fracture of Le Fort type who were treated at the Surgical Department, Ban Pong Hospital, Ratchaburi, Thailand during the past 21 years (September 1st, 1979 - August 31st, 2000) is presented. Most of the patients were male (84.4%). Patients mainly affected were in the third decade of life (54.7%) with an age range of 13 - 65 years old. The etiology of the fracture was mostly related to road traffic accidents (90.6%). The most common type was Le Fort II fracture (54.7%), followed by associated facial bone injury were mandible (47.4%) and associated other organ injuries were fractures elsewhere (50.0%). Open reduction with intermaxillary fixation and maxillary suspension were the treatments of choice and the results were considered to be successful with only mild post-operative complications.

Key word : Maxillofacial Injury, Le Fort Fracture, Surgical Treatment

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The maxillary bone is the main part of the upper jaw while the episode of fracture can result in malocclusion and the problem of mastication if the fracture could not be reduced completely. The most common facial fracture involved the alveolar process and Le Fort. In 1866, Guerine reported the characteristics of maxillary bone fracture, lower and horizontal line, which was later named "Guerine fracture"(1).

Rene Le Fort (a French surgeon) studied maxillofacial fracture by performing artificial beating of 35 cadaver's faces and dissecting to explore

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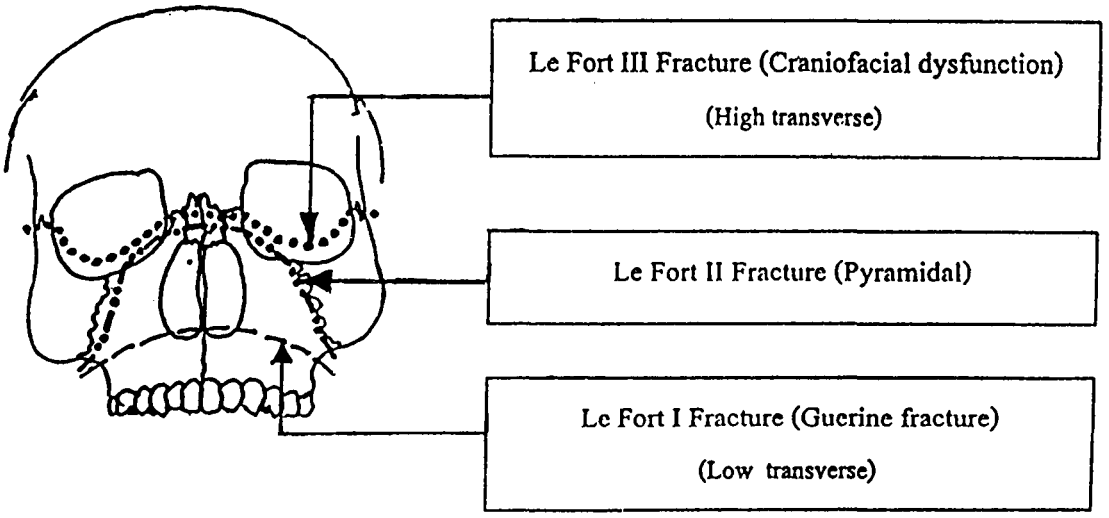

Fig. 1. Types of Le Fort fracture.

the evidence of maxillary bone fracture[1,2]. The result revealed the characteristics of fracture which could be categorized into 3 types : Le Fort fracture type I, II and III (Fig. 1). The findings improved the surgical knowledge for diagnosis and treatment of upper jaw fracture including the reconstruction and cosmetic method for both congenital and acquired deformities.

This report aimed to analyse the characteristics of maxillary bone fracture in patients in terms of demographic data, incidence, etiology, coincidence injury and case management. It includes the result of cases which underwent operation in the surgical unit, Ban Pong General Hospital, Ratchaburi, Thailand over the past twenty one years (September 1st,1979 - August,31st, 2000). The results should be beneficial for further management particularly at provincial hospital level.

MATERIAL AND METHOD

All cases of Le Fort fracture (LFF), operated on by the author, between September 1st, 1979 and August 31st, 2000, were studied. The information was gathered from the patients' profile i.e., operative notes, dental information and records of skull X-rays. The data were described on a demographic basis i.e., age, gender, etiology, type of LFF and treatment procedure.

RESULTS

Five hundred and eighty five cases of maxillofacial fracture were studied and the results revealed that there were 64 cases of LFF or 10.9 per cent of total cases, an average of 3 cases of LFF per year. (Table 1, Fig. 2)

The age group and gender distribution were analysed and the results revealed that the majority of cases were male (84.4%). The most common age group was 21-30 years old (54.7%); followed by 11-20 years old (18.7%). The ratio of incidence of LFF in male to female was 5.4 : 1 (Table 2).

The etiology of LFF was verified. The majority fractures were from traffic accidents (90.6%). The remaining (10%) cases were domestic violence (3.1%), falls (1.6%) and miscellaneous (4.7%) (Table 3).

Table 1. Frequency and percentage of maxillofacial fracture attributed to Le Fort fracture.

Pattern of fracture	Number	%
Le Fort	64	10.9
Others*	521	89.1
Total	585	100.0

* Others means mandibular, zygomatic, nasal and frontal bones.

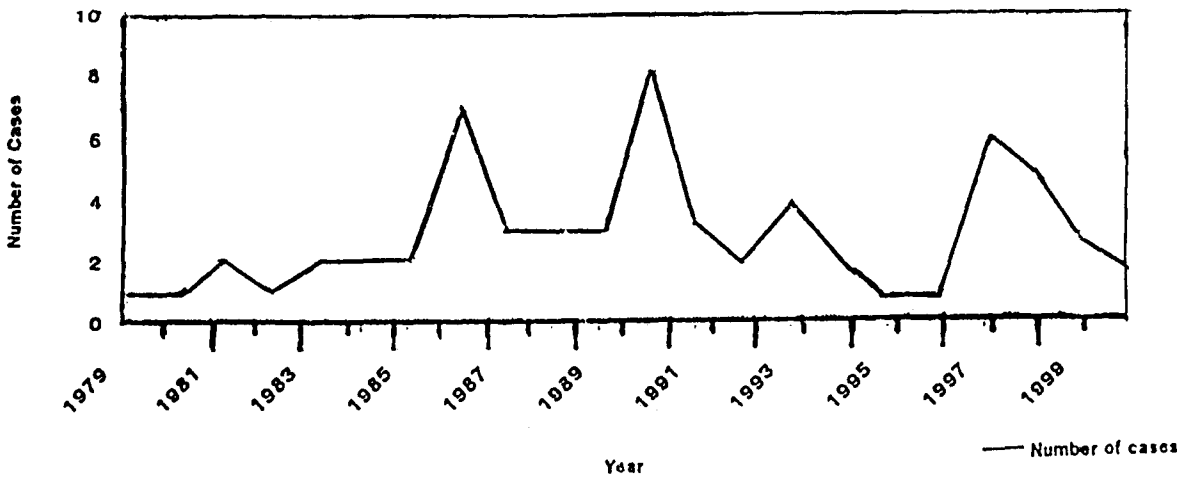

Fig. 2. Incidence of Le Fort fracture between 1979-2000.

Table 2. Age group and gender distribution of Le Fort fracture.

Age (Year)	Gender				Total	%
	Male		Female			
	N	%	N	%		
11-20	11	17.2	1	1.6	12	18.7
21-30	30	46.8	5	7.8	35	54.7
31-40	9	14.0	2	3.1	11	17.2
41-50	2	3.1	1	1.6	3	4.7
≥ 51	2	3.1	1	1.6	3	4.7
Total	54	84.4	10	15.6	64	100.0

Table 3. Etiology of Le Fort fracture attributed by type of accident.

Accident	Gender				Total	%
	Male		Female			
	N	%	N	%		
Traffic	48	75.0	10	15.6	58	90.6
Domestic violence	2	3.1	0	0	2	3.1
Falls	1	1.6	0	0	1	1.6
Miscellaneous (sport, industrial)	3	4.7	0	0	3	4.7
Total	54	84.4	10	15.6	64	100.0

Pattern of Le Fort fracture

The pattern of LFF was categorized by the criteria described by Le Fort. The results revealed that about half were Le Fort II, followed by Le Fort I and Le Fort III (54.7, 25.0, 10.9%, respectively). Among those 64 cases, there were 5 cases coincidently with hard palate fracture (7.8%) (Table 4).

Table 4. Pattern of Le Forte fracture.

Pattern of fracture	N	%
Le Fort I	16	25.0
Le Fort II	35	54.7
Le Fort III	7	10.9
Le Fort I and II	3	4.7
Le Fort I and III	3	4.7
Total	64	100.0

The maxillofacial fractures of 64 cases were categorized as LFF alone, (26 cases or 40.0%). The mandible was the most common coincidental fracture (18 cases or 47.4%); next was zygoma (14 cases or 40%) while a combination of both occurred in 5 cases or 13.2 per cent (Table 5).

Besides facial fracture, LFF was associated with other organ injuries; 18 cases or 28.1 per cent, could be attributed to fractures elsewhere (50.0%), cerebral injury (22.2%) and eye injury (16.7%) (Table 6).

Treatment

All cases of LFF were operated on within 3 days after the injuries (range from 1-22 days), and the procedure was as follows:

1) Sixty two cases or 96.9 per cent were tracheostomized prior to anesthesia induction, some had tracheostomy performed on arrival, with only two cases not having it before operation. 2) All cases underwent open reduction and 95.3 per cent of them had arch-bar fixation and craniomaxillary suspension. 3) Closed reduction of the nasal bone was performed in 24 cases or 37.5 per cent. 4) There were 6 cases or 6.25 per cent who had silastic rubber sheath implantation procedure. (Table 7, Fig. 3 and Fig. 4)

Result and Consequence

The results of post-operative treatment were highly satisfactory from both the functional and cosmetic aspect (89.1%). Only 7 cases or 10.9 per cent had complications of residual deformities i.e., compression of the zygomatic bone, temporary stiffness

Table 5. Occurrence of other maxillofacial fracture associated with Le Fort fracture.

Fracture	N	%
Le Fort	26	40.0
Le Fort with other maxillofacial fracture	38	60.0
- Frontal	1	2.6
- Zygoma	14	36.8
- Mandible	18	47.4
- Zygoma & mandible	5	13.2
Total	64	100.0

Table 6. Le Fort fracture attributed to associated injuries.

Associated Injuries	N	%
Le Fort	46	71.9
Le Fort with other organ Injuries	18	28.1
- Fracture elsewhere	9	50.0
- Cerebral	4	22.2
- Eye	3	16.7
- Thoracic	1	5.5
- Abdomen	1	5.5
Total	64	100.0

Table 7. Operative procedure in Le Fort fracture patients.

Procudure*	N	%
Tracheostomy	62	96.9
Open reduction	64	100.0
- Arch-bar fixation	3	4.7
- Arch-bar fixation and craniomaxillary suspension	61	95.3
Closed reduction of nasal bone	24	37.5
Silastic rubber sheath implantation	4	6.25

* Patients may have had more than one procedure

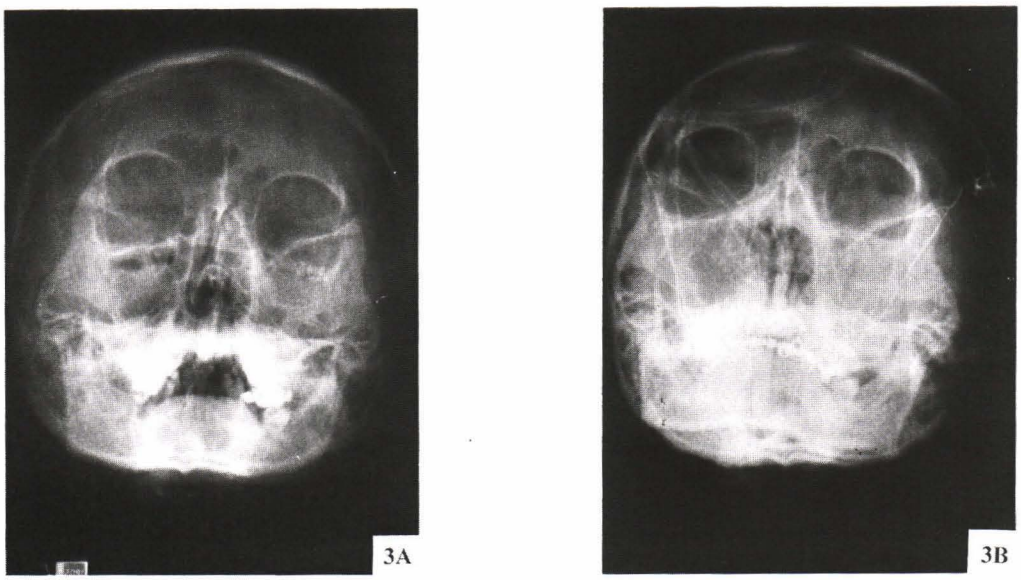

Fig. 3. Radiograph of Water's view of the skull of a 24-year-old female showing Le Fort Fracture Type II. (3A) Pre-operative, (3B) Post-operative, open reduction with intermaxillary fixation and maxillary suspension.

of the temporomandibular joint and infection, respectively. (Table 8)

DISCUSSION

The Ban Pong Hospital is a general hospital which presently can accommodate 420 in-patients. The hospital has to provide health service to 160,000 people in surrounding areas. It has facilities, physicians and health personnel of various fields of specialities including expertise in maxillofacial injury management. The author performed the operative treatment of 64 cases of LFF over two decades and the details are as follows:

1. Patient aspect

The past experience of 21 years revealed that the incidence of LFF was 1-8 cases per year. This figure represented only Ban Pong Hospital and the cases selected for this study were those who were operated on by the author and had complete documentation. Surprisingly, there are 3 private hospitals within a radius of 15-20 kilometers and tertiary hospitals in-charge[3-5]. The crucial point is that if the physician does not recognize the LFF it will render the consequences of deformity and dysfunction which might affect the quality of life of the patients[4,6].

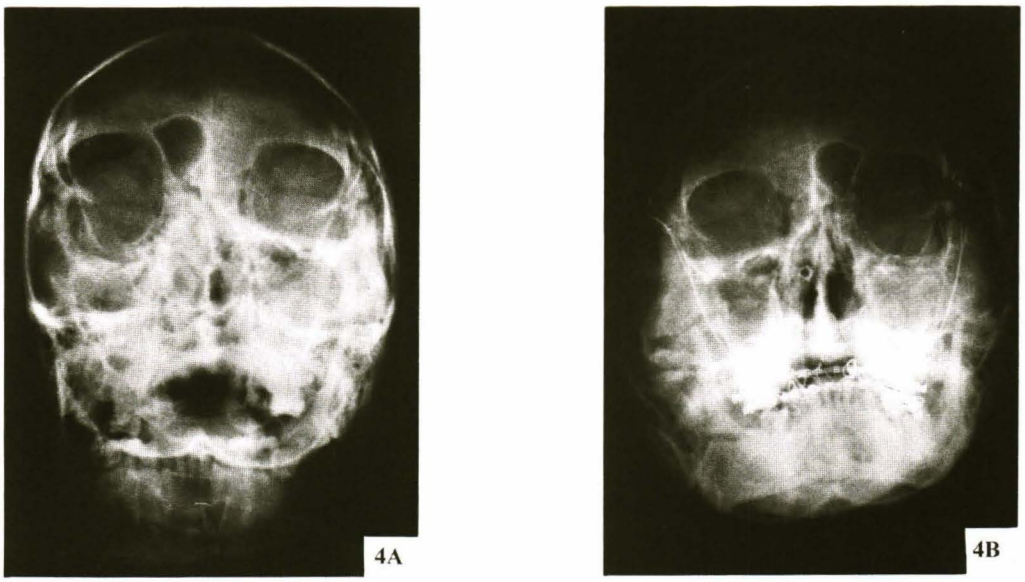

Fig. 4. Radiograph of Water's view of the skull of a 46-year-old male showing Le Fort Fracture Type II and III, with displacement of left zygoma. (4A) Pre-operative, (4B) Post-operative, open reduction with intermaxillary fixation and maxillary suspension.

Table 8. Post-operative complications of Le Fort fracture patients.

Result	N	%
Satisfactory (function and cosmetic)	57	89.1
Complication	7	10.9
- Residual deformity	3	42.9
- Infection	4	57.1
Total	64	100.0

2. Proportion of Le Fort fracture cases

The proportion of LFF was 10.9 per cent of all maxillofacial injuries. This finding is supported by a report from Siriraj Hospital[7], but different from a report from a dental unit center which included a large number[5,6].

3. Age and gender

The incidence was higher among males due to the nature of occupation and outdoor activities; the majority of patients were 21-30 years old or 54.7 per cent, which is similar to other studies[3,6,8,10,13].

4. Etiology

More than ninety per cent of cases were from traffic accidents especially involving motor cycles which is supported by other studies[3,7-9]. The risk of motor cycle accidents is attributed to many factors ; high speed limit, noise, while under the influence of narcotics or alcohol. The results are different from those reported in foreign countries where more stringent driving regulations exist, such as compulsary helmet use and safety belts[10-12]. Only about three per cent was attributed to domestic violence which was lower than studies from other countries[10-13,15].

5. Type of Le Fort fracture

The study found that all types of LFF followed the criteria of the incident rate which could be arranged as type II > type I and type III, respectively[16]. The study was compatible with other studies and it was striking that the complication of hard palate fracture was as high as 8 per cent[3-5, 14].

6. Coincidence injury

This series of LFF found the coincidental injury and the majority, to be mandibular fractures but different from the report of Siriraj Hospital which was zygomatic fracture[9]. The difference might come from the cause of injury in Ban Pong Hospital where the majority of motor cycle accidents and the ratio of upper jaw and lower jaw fracture was 4 : 1 which was supported by the report of Saraburi and Vachira Bhuget Hospital[9]. Motor cycle accidents result in a direct crash of the exposed face to the road but car accidents involve face crash to the steering wheel. The zygomatic bone is located adjacent to the maxillary bone, so the injury always affects both bones. The characteristics of LFF type II and III include fracture on alignment of the nasal bone and the treatment procedure depends on the extended fracture. This study included two per cent of frontal bone fracture, which is similar to the report of Siriraj Hospital[3]. The coincidence of LFF with zygomatic and mandibular bone was 13.2 per cent which shows the severity of the fracture episode.

7. Le Fort fracture with other organ injuries

The analysis of 64 cases of LFF revealed that 28.1 per cent involved other organs. The most common coincidental fracture was of the extremities which were compatible with motor cycle accidents, and next was brain injury particularly in cases who underwent skull operations (6%) which was lower than that reported from Siriraj Hospital and other countries, mainly was brain injury[3,14,15]. There were 3 cases involving the eyes and one case was enucleated as the extension of injury, so case management played an important role in saving the life of the patient when first seen. The emergency unit should therefore be managed by a multispecialist team including a surgeon, orthopedist, plastic surgeon, maxillofacialist, neurosurgeon and ophthalmologist for better care and management to achieve the best results[10,12].

8. Operative treatment

All cases of LFF should be tracheostomized for a better approach of face surgery, particularly, reduction of nasal and maxillary bones and to minimize the risk of anesthesia and post-operative care [3,16]. As for cosmetic purposes, alternative procedures were performed, there were two cases of LFF without tracheostomy which rendered the problem of operation and post-operative care.

The manipulation of maxillary disimpaction forceps with arch-bar ; intermaxillary fixation and craniomaxillary suspension at the point of zygomatic process of frontal bone on both sides yielded good results and only 3 cases did not undergo craniomaxillary suspension for a firm fracture site. The addition of interosseous fixation, mostly by wiring was selected for some cases of maxillary fracture but provided for all zygomatic and mandibular fracture.

The reduction of nasal fracture was performed in 24 cases and only one case required lead plate fixation for the specific fracture of maxillary process. Investigation for fracture of the floor of the orbit was selected in those who had diplopia and radiological findings, and a silastic rubber sheath was applied to reconstruct the problem in four cases.

9. Result

Maxillary bone has a high blood supply which is an advantage for reconstruction of the bone and has very few complications such as infection[16-22]. This report revealed that 89.1 per cent showed satisfactory results in terms of good function, proper occlusion and good cosmetic result without diplopia. Only 3 cases had complications of temporary temporomandibular joint stiffness because the LFF operation was delayed by three weeks after the accident due to their associated neurosurgical condition. Four cases longer than 4 weeks were found to have infection of the interrosseous wiring point of the mandibular bone rendering in prolongation of wearing of the intermaxillary fixation[3,4,9,15]. All cases underwent operation and yielded good results without mortality.

SUMMARY

Two decades of experience of performing LFF operations in Ban Pong Hospital and reporting of 64 cases revealed that the majority were male, aged 21-30 years, and that traffic accidents were the most frequent cause. LFF type II including fracture

of the mandible showed the highest occurrence. All cases were tracheostomized prior to operation with only 10.9 per cent of cases developing complications. However, ultimately all of them resumed normal conditions and functions. This report should, on the one hand, benefit LFF patients and, on the other hand, help improve case management to create a directional approach in provincial hospitals.

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การผ่าตัดรักษากระดูกหน้าหักแบบเลอฟอร์ตในโรงพยาบาลบ้านโป่ง ระหว่าง พ.ศ. 2522–2543

*วิทยา จารุพูนผล, พ.บ.**

ได้ศึกษาย้อนหลังผู้ป่วยที่มีกระดูกหน้าหักแบบเลอฟอร์ต ที่ได้รับการผ่าตัดรักษาในโรงพยาบาลบ้านโป่ง ระยะเวลา 21 ปี ตั้งแต่ 1 กันยายน 2522 ถึง 31 สิงหาคม 2543 มีผู้ป่วยทั้งสิ้น 64 ราย เฉลี่ยประมาณปีละ 3 ราย เป็นเพศชาย 54 ราย (ร้อยละ 84.4) และเพศหญิง 10 ราย (ร้อยละ 15.6) อายุระหว่าง 13 – 65 ปี ช่วงอายุที่พบมากที่สุดคือ 21 – 30 ปี พบ 35 ราย (ร้อยละ 55.0) สาเหตุส่วนใหญ่ คือ อุบัติเหตุจราจรทางบก 58 ราย (ร้อยละ 90.6) เป็นสาเหตุจากรถจักรยานยนต์มากกว่ารถยนต์ ประเภทของการหักที่พบบ่อยที่สุด คือการหักแบบเลอฟอร์ตประเภทที่ 2 พบ 35 ราย (ร้อยละ 54.7) กระดูกหน้าอื่น ๆ ที่หักร่วมด้วย ที่พบบ่อย คือกระดูกขากรรไกรล่าง 18 ราย (ร้อยละ 47.4) และกระดูกโหนกแก้ม 14 ราย (ร้อยละ 36.8) พบร่วมกับการบาดเจ็บระบบอื่น 18 ราย (ร้อยละ 28.1) โดยครึ่งหนึ่งเป็นกระดูกแขนขาหัก เกือบทุกรายได้รับการเจาะคอก่อนการผ่าตัดจัดกระดูกให้เข้าที่ ร่วมกับการยึดกระดูกขากรรไกรบนและล่างเข้าหากันและทำ Maxillary suspension ซึ่งจะได้ผลดี ในผู้ป่วยบางรายได้ทำการซ่อมแซมพื้นของกระบอกตา และจัดกระดูกจมูกเข้าที่ ผลการผ่าตัดพบว่า 57 ราย หรือร้อยละ 89.1 ได้ผลเป็นที่น่าพอใจหายเป็นปกติ มีเพียง 7 ราย หรือร้อยละ 10.9 ที่พบภาวะแทรกซ้อน ได้แก่การยึดติดของข้อขากรรไกร และภาวะการติดเชื้อของแผล ซึ่งทุกรายสามารถแก้ไขสู่ภาวะปกติในระยะเวลา 1 – 2 สัปดาห์

คำสำคัญ : บาดเจ็บของกระดูกหน้า, การหักแบบเลอฟอร์ต, การรักษา

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