The mandibular condyle is generally protected in the glenoid fossa, but the condylar neck is relatively fragile. Subcondylar fractures, which often present as greenstick fractures, are usually seen in children because their bones are more flexible and therefore are more likely to be bent, rather than to undergo a complete breakage.\(^1\) In elderly people, greenstick fractures of the condyle are extremely rare.

This study presents the outcomes of a conservative approach to a greenstick condylar fracture in an elderly patient. Serial changes of the inclination angle were measured in a greenstick fracture of the mandibular subcondyle treated with intermaxillary fixation (IMF) in a 64-year-old woman.

**CASE HISTORY**

A 64-year-old nonosteoporotic woman presented to an outpatient clinic complaining of pain on her chin. While waiting for an elevator, she lost consciousness and hit her face on the floor. She had a limited mouth-opening of 13 mm. panoramic radiography and computed tomography confirmed a greenstick (incomplete) fracture of the left condyle, in which the lateral side of the bone was fractured and the medial side was bent. The medial inclination was approximately 40.4 degrees. On the second post-trauma day, IMF was performed using arch-bars and a prefabricated occlusal stop. Serial Towne’s views were taken. The inclination of the fractured condyle was measured and compared with the contralateral side. The difference in inclination angles (DI) between the fractured and contralateral sides was plotted over time. In SPSS version 19.0, an exponential regression model was constructed. In this patient, a greenstick (incomplete) fracture of the condyle (40.4 degree inclination) was treated with IMF and a prefabricated occlusal stop. On day 42 post-IMF, the inclination angle had decreased to 15.6 degrees, only 5.4 degrees greater than the contralateral side. The DI was fitted to exponential regression model \(y = 25.111e^{-0.028x}, P = 0.004\). This case shows that even in an elderly patient, a greenstick fracture of the mandibular condyle can be treated by vertical lengthening using an occlusal stop and IMF. (Plast Reconstr Surg Glob Open 2021;9:e3748; doi: 10.1097/GOX.0000000000003748; Published online 9 August 2021.)
fracture on the left condyle, in which the lateral side of the bone was fractured and the medial side was bent. The medial inclination was approximately 40.4 degrees. (See figure 1, Supplemental Digital Content 1, which displays preoperative computed tomography. Upper: parasympyseal fracture involved only at the lingual side. Middle & lower: greenstick fracture on the right condyle and parasympyseal fracture at the left lingual side. http://links.lww.com/PRSGO/B741.) (See figure 2, Supplemental Digital Content 2, which displays serial Towne’s views. 3A: before intermaxillary fixation (IMF), 3B: post-IMF day 1, 3C: post-IMF day 21, 3D: post-IMF day 42. http://links.lww.com/PRSGO/B742.)

The patient also had a parasympyseal fracture. Parasympyseal fracture involved only at the lingual side (See figure 1, Supplemental Digital Content 1. http://links.lww.com/PRSGO/B741). On the second post-trauma day, IMF was performed using arch-bars and a prefabricated wafer (occlusal stop).

**MEASUREMENT METHOD**

The inclination of the fractured condyle (IFC) was measured (Fig. 1) and compared with the contralateral side. The difference in inclination angles (DI) between the fractured and contralateral sides was calculated and plotted at various postoperative time points. In SPSS, version 19.0 (IBM, Armonk, N.Y., USA), an exponential regression model was constructed.

**RESULTS**

Immediately after IMF, the inclination of the fractured segment did not change (36.2 degrees). (See figure 2, Supplemental Digital Content 2. http://links.lww.com/PRSGO/B742.) On post-IMF day 4, an occlusal stop was applied, which resulted in straightening of the fractured right condyle. The patient’s hospital course was uneventful and she was discharged 5 days after IMF.

On post-IMF day 21, the IFC was 27.8 degrees (See figure 2, Supplemental Digital Content 2. http://links.lww.com/PRSGO/B742.). On post-IMF day 28, the IFC was 26.5 degrees and a rubber band was applied. On post-IMF day 35, the IFC was 23.8 degrees and a rubber band was applied at night only. On post-IMF day 42, the IFC was 15.6 degrees, and the arch bar was removed (Fig. 3D).

On post-IMF day 42, the inclination angle had decreased to 15.6 degrees, only 5.4 degrees greater than the contralateral side. The DI between the fractured and contralateral sides was fitted to an exponential regression model ($y = 25.111e^{-0.028x}$, $R^2 = 0.841$, $P = 0.004$) (Fig. 2, Table 1).

On post-IMF 10th week and 19th week, mouth opening was 27 mm and 29 mm, respectively. On post-IMF 10th month, mouth opening was 36 mm and occlusion was neu troclusion (Fig. 3).
DISCUSSION

In the literature, several cases of condylar greenstick fractures in children have been reported.\(^1\)\(^-\)\(^3\) In elderly people, however, greenstick fractures of the condyle are very rare.

In this patient, a greenstick (incomplete) fracture of the condyle (40.4\(^{\circ}\) degree inclination) was treated with IMF and a pre-fabricated wafer (occlusal stop). On post-IMF day 42, the inclination angle had decreased to 15.6\(^{\circ}\), only 5.4\(^{\circ}\) greater than the contralateral side. The DI between the fractured and contralateral sides was fitted to an exponential regression model (\(y = 25.111e^{-0.028x}, R^2 = 0.841, P = 0.004\)).

Because the parasymphyseal fracture involved only the lingual side, we did not perform rigid internal fixation. It is thought that the inclination of the fractured right condyle was straightened because the occlusal stop increased the vertical dimension, which pulled the distal segment downward.

In displaced condyle fractures, especially in young people, the authors prefer open reduction and internal fixation via submandibular incision.\(^4\) In an elderly patient or smoker where the blood supply is decreased to the condyle area, we prefer intermaxillary fixation using occlusal stop to avoid infection or necrosis of the fracture fragment.\(^5\)

This patient was lucky to have enough teeth for applying IMF. In an edentulous patient, a monoblock Gunning splint is recommended. Gunning splints can be stabilized using various techniques such as per-alveolar wiring, circummandibular wiring, circumzygomatic wiring, and cortical screws. A conventional Gunning splint consists of two blocks, which need fixation by connecting the upper and lower blocks. In our previous report, we used a monoblock Gunning splint, which does not need the upper and lower splints to be connected with wire loops or elastic bands, and maintained sufficient vertical length in the treatment of an edentulous mandibular fracture.\(^5\)

This is a report of a single case and a regression model has limited utility. However, we believe that this model opens a possibility to presume the expected period of removal of intermaxillary fixation. This case shows that even in an elderly patient, a greenstick fracture of the mandibular condyle can be treated by vertical lengthening using an occlusal stop and IMF.

Kun Hwang, MD, PhD
Department of Plastic Surgery
Inha University College of Medicine
27 Inhang-ro, Jung-gu
Incheon, 22332
South Korea
E-mail: jokerhg@inha.ac.kr

| Table 1. Changes of Inclination Angles |
|--------------------------------------|
| POD   | Fractured (Degree) | Contralateral (Degree) | Difference (Degree) | Medical Event |
|-------|--------------------|------------------------|---------------------|---------------|
| -2    | 40.4               | 12.2                   | 28.2                | IMF           |
| 0     | —                  | —                      | —                   | —             |
| 1     | 36.2               | 12.9                   | 23.3                | —             |
| 2     | 32.4               | 12.8                   | 19.6                | —             |
| 4     | —                  | —                      | —                   | —             |
| 21    | 27.8               | 12.1                   | 15.7                | Occlusal stop applied |
| 28    | 26.5               | 12.2                   | 14.3                | Rubber band applied |
| 35    | 23.8               | 12.1                   | 11.7                | Rubber band at night |
| 42    | 15.6               | 10.2                   | 5.4                 | Arch bar removed |

IMF: intermaxillary fixation; POD: post-IMF day.
ACKNOWLEDGMENT

The authors are grateful to Hun Kim, PhD, Department of Plastic Surgery, Inha University College of Medicine, for making the table and Figure 2.

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