

GREENSTICK FRACTURES



“La Primavera” Tempera on wood, c. 1482 Sandro Botticelli, Galleria degli Uffizi, Florence.

Botticelli’s “La Primavera” (or “Spring”) is one of the mediaeval world’s most enigmatic paintings. Art historians have long debated its meaning but no general consensus has ever been achieved. Whatever its meaning it is truly one of the great masterpieces of the Italian Renaissance. It has been claimed that it was painted for Lorenzo de Medici’s, wedding in 1482, although many authorities date it several years earlier than this.

The work is thought to either depict a series of stories or it may symbolise the season of spring and its association with various aspects of love both pure and lustful. The main central figure is the goddess of love, Venus, who seems to divide the work into two separate stories. All the nine figures derive from classical Greek mythology. From left to

right we see, Mercury, the three Graces, Cupid above Venus, Flora, Chloris and Zephyr. At an elevated level compared to the other figures, Venus presides over the whole garden, and although the Goddess is today primarily seen as an erotic symbol, in the time of Botticelli she represented many different noble and womanly virtues. Lorenzo de Medici was still only a teenager when the work was done and perhaps Venus was intended to point the way to a virtuous future for the young prince. Above Venus is a blindfolded Cupid. For the young Medici prince "love is blind".

On the extreme left we see Mercury, the messenger of the gods, who raises his caduceus, a staff entwined with winged serpents, symbols interestingly of the medical profession, and perhaps intended as a symbol to the future good health of the young prince. Mercury raises the staff into the gathering clouds that threaten to spoil the idyllic scene. He is holding back the dark clouds that threaten to spoil the eternal springtime. Beside Mercury are the three Graces who convey a sense of movement with the dynamic interaction of their hands. Each represents the Botticelli ideal of female beauty, golden hair, ivory skin, and solemn expression. They are the embodiment of youth, health and vitality, of spring itself.

To the right of Venus we see Zephyr, the great West Wind who lusts after the nymph Chloris. He emerges as a great gust from the woods, the trees bending with the force of the gale of his arrival. He wants to take Chloris for his wife, but Chloris is startled by the god and frightened and attempts to flee. Does this reflect the great Medici prince's own situation? Perhaps his own love is a little frightened to be the wife of such a powerful figure! Zephyr promises Chloris the immortality of the gods. He grabs her by the waist as she attempts to run, and even before she can take the first step the transformation has already begun as we see a sprig of rose vine emerging from her mouth. Just to the left of the startled Chloris we see her in the near future now fully transformed into what is perhaps Botticelli's most beautiful and most recognized female figure - Flora - the goddess of flowers and spring. Although Flora eventually is happy to be with Zephyr, even bend to his will, just as the trees around Zephyr are seen to bend in the wake of his power, she is not broken by his will. She becomes a great and respected goddess to the people in her own right and is not merely the compliant and obedient wife of Zephyr. She is revered throughout the classical world as the beautiful goddess of new life. Perhaps Lorenzo envisaged this very destiny for his own future wife.

Botticelli's "Primavera" has been a source of wonder and speculation among art historians for centuries. Perhaps many of its mediaeval meanings and symbols have been lost to us in the modern age, and interpretation is in the eye of the beholder. To the astute medically trained eye, the bending trees around Zephyr are like young greenstick saplings. They are young and supple and bend, even crack with adversity, but never completely break. Like the story of Chloris greenstick fractures although initially distressing will usually have a most happy ending.

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Introduction

Greenstick Fractures are *incomplete* fractures that are seen in childhood.

They are incomplete in the sense that there is fracturing through one cortex but not through the opposite cortex – just as when a young tree twig or branch is bent and breaks on the convex side but remain intact on the opposite concave side. Older more brittle branches typically snap completely in two!

These fractures are extremely common in children.

They are not the same thing as a torus (or buckle) fracture (see separate guidelines).

Greenstick fractures may displace with time (torus fractures do not).

Pathology

By convention the compression side of a fracture is that which is angled acutely, whilst the tension side of a fracture is that which is angled obtusely.

In torus fractures typically there is a failure of the dorsal cortex on the compression side, (ie the *concave* side of angulation) 2-3 cm proximal to physis. The volar cortex (the tension side in this case) remains intact (see Torus fracture guidelines).

In **greenstick fractures** there is a failure (ie fracture) on the tension side of the bone, ie the obtusely angled (convex) side.

In distinction to torus fractures, displacement can occur with time in greenstick fractures.

Mechanism

The most common mechanism for a greenstick fracture is a fall on the outstretched hand that results in injury to the distal **radius and/or ulna**.

Clinical features

Symptoms can be variable and range from relatively mild pain which does not overly distress the child to significant distress with the child refusing to use the arm.

Frank deformity may or may not be seen.

There may be some mild local swelling.

Point tenderness over the point of fracture is characteristic, though is often difficult to locate precisely in a distressed child.

Investigations

Plain radiology

Plain radiography readily makes the diagnosis.



Typical appearance of a greenstick fracture of the distal radius in a 10 year old female.

Fracture may be incomplete (ie “greenstick”) in the radius and/or ulna, or the fracture may be complete in one bone and incomplete (greenstick) in the other.

When only one forearm bone is broken, it is important to check the integrity of the proximal and distal radio-ulnar joints for associated dislocation.

Management

1. Analgesia:

- Simple oral analgesia may be all that is required for this injury.
- Intranasal fentanyl is a useful option for children with significant distress.

2. Reduction:

This may or may not be necessary depending on the degree of angulation and the age of the patient.

Relatively greater degrees of angulation are acceptable in children when compared to adults, and these will correct as the child grows.

In general terms for greenstick fractures of the distal radius:

- Less than 10 years of age an angulation of less than 15 degrees without clinical deformity is acceptable.
- In those over 10 years of age there should be no dorsal angulation.

3. Immobilization:

- Greenstick fractures (in contrast to true torus fractures) do require immobilization in a plaster cast.
- A below elbow plaster cast is sufficient for a period of 4-6 weeks (depending on the initial severity of the injury).
- Repeat radiographs should be done after 1 week, to ensure that no displacement has occurred.
- There should be no contact sports/monkey bars/trampolines/etc for a further 4 weeks *after* removal of the plaster.

Disposition:

There should be orthopaedic referral in cases of:

- Open fractures
- Significant displacement
- Injuries involving the epiphyseal growth plates or intra-articular surfaces

- Clinical deformity.

References

1. Wheelless' Textbook of Orthopaedics: www.wheelessonline.com
2. Davidson J. S, Brown D. et al. Simple treatment for torus fractures of the distal radius. Journal of Bone & Joint Surgery, Vol. 83-B, no. 8, November 2001.
3. Greenstick Fractures of the Radius, Northern Health June 2012.

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