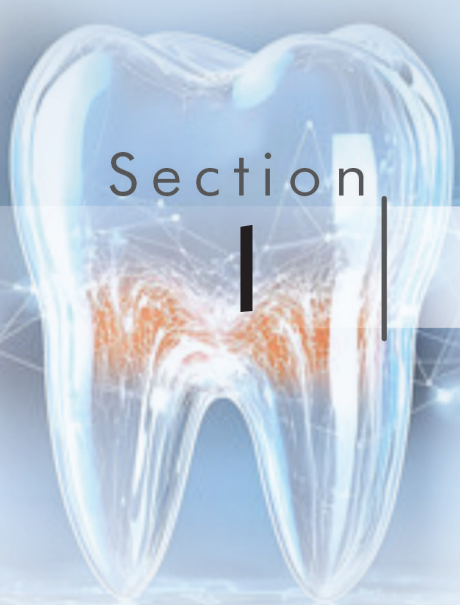

Section

I

Prosthodontics and Crown & Bridge

Notes

Chapter 1

Interdigital Stent: A Valuable Adjunct in Prosthodontics

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INTRODUCTION

The most frequent congenital malformation that manifests at birth in the extremities is syndactyly. Syndactyly is a congenital condition where two or more digits (fingers or toes) are fused together. In the developing human, all digits are initially fused by a layer of loose mesenchymal tissue. Syndactyly occurs as a failure of separation of this fusion. It can vary in severity, ranging from a slight webbing of skin between the digits to more extensive fusion where the digits are partially or completely joined. Treatment usually involves surgical separation of the fused digits typically performed during infancy or early childhood.

CASE HISTORY

A 3-year-old female patient, a known case of Apert syndrome was referred for the correction of wound contracture after syndactyly release surgery **(Fig. 1.1)** to the Department of Prosthodontics and Crown & Bridge.

On eliciting past medical and dental history, it was found that the patient had undergone the cranial synostosis correction surgery 1 year ago. Patient presented with features of midfacial hypoplasia, short stature, acrocephaly and syndactyly of both fingers and toes **(Fig. 1.2)**.

Fig. 1.1: Dorsal and palmar surfaces of the defect

General examination revealed that the patient has retarded growth and delayed milestones. Neuromuscular coordination appeared to be normal and speech was normal. Local examination of the defect revealed scars from the previous surgery along the entire length of the first web space.

Longitudinally, there was a constant symphalangism at the proximal interphalangeal (PIP) joints of the digits and at the interphalangeal (IP) joint of the thumb.The space between the fused digits appeared narrower compared to the normal hand wrist radiograph, indicating the presence of soft tissue webbing. It also revealed the classical feature of the Upton's class III syndactyly that is the union of the nail and bone between the thumb and the neighbouring digit **(Fig. 1.3)**. On assimilating data from clinical and radiographic evaluation, the wound contracture of the first web space—post complex syndactyly release surgery was correlated.

Fig. 1.2: Facial features of Apert syndrome

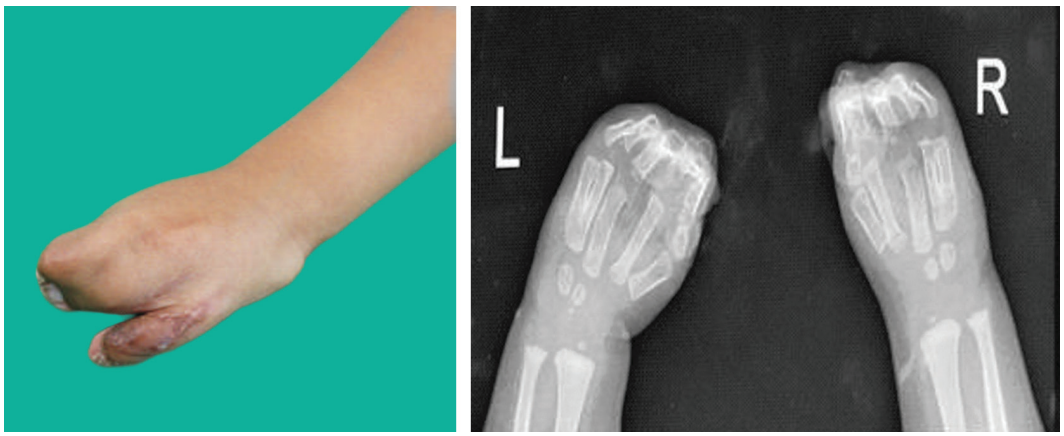

Fig. 1.3: Clinical photograph of the defect and preoperative hand–wrist radiograph

Treatment Plan

It was planned to correct the wound contracture. An interdigital stent was devised in a manner that it can be used as a dynamic stent for 9 weeks and static stent for 3 weeks to achieve the favourable results.

Steps in Fabricating the Stent

Further to promote the surgical wound healing and prevent the wound contracture, an interdigital stent was planned. Steps involved in the fabrication of the stent was as follows:

a. A Putty (GC Flexceed Putty) spacer was placed in the first web space. After which the impression of the palm was made using the irreversible hydrocolloid material (Zhermack Hydrogum) **(Fig. 1.4)**.
b. Master cast was poured using the Type III Gypsum product (Kala Bhai Gypsum Product—Type III). Scoring of the cast was then done to create the passive contact of the stent to be fabricated **(Figs 1.5 and 1.6)**.
c. Then the putty spacer was picked up in the impression (over the cast). The modelling wax (MAARC, modelling wax) was then used to fabricate the wax pattern with extension over the dorsal and palmar surface for retention **(Fig. 1.7)**.
d. The wax pattern was then acrylized using the lost wax technique and the heat cured PMMA resin (DPI heat cure denture base material clear, universal pack) was packed into the space and cured **(Figs 1.8 and 1.9)**.
e. Velcro straps were chosen as the retentive element for the stent **(Fig. 1.10)**.

The stent was used as a dynamic stent for 9 weeks, and thereafter as a static stent for 3 weeks using the inelastic bands.

Clinically the outcome was excellent. Interdigital distance of the first web space was evaluated using the hand–wrist radiographs at day 1, 6th week and 12th week, respectively **(Fig. 1.11)**. The tracing of radiographs before, during and after treatment shows the improvement of the interweb space **(Fig. 1.12)**.

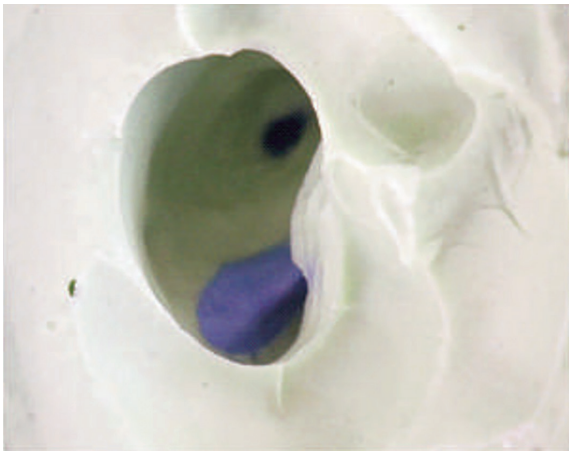

Fig. 1.4: Impression of the palm

Fig. 1.5: Master cast with putty spacer

Fig. 1.6: Scored cast

Fig. 1.7: Wax pattern

Fig. 1.8: Processing of the stent

Fig. 1.9: Retrieved stent

Fig. 1.10: Stent and retentive elements for static and dynamic phase

Fig. 1.11: Serial evaluation of inter web space

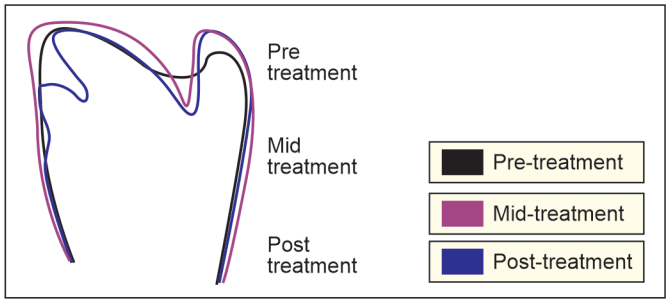

Fig. 1.12: Tracing of the radiographs at different phases

DISCUSSION

Apert syndrome is a rare congenital disorder caused by an autosomal dominant inheritance which manifests with craniosynostosis, midface hypoplasia, and symmetric syndactyly of hands, and feet.[1]

According to Upton's classification, syndactyly can be classified as Type I—spade hand, Type II—spoon/mitten hand, Type III—rose bud appearance.[2] The pattern may vary as cutaneous or osseous. This leads to progressive loss of flexion, hand grip strength, dexterity and poor aesthetics between infancy and childhood. Early surgical intervention is recommended to separate these fused fingers and improve hand function such as hand grip strength, dexterity and aesthetics. Surgical wound contracture refers to the excessive tightening or shrinking of a surgical wound during the healing process, resulting in reduced flexibility and movement of the surrounding tissues.[3] By proper splinting, physiotherapy and timely surgery, whenever needed, adduction contracture can be totally prevented.

Charles T Stent was the first clinician to use the splints in early 1850's.[4] Surgical Stent is defined as the eponym for a device used to apply pressure to soft tissues to facilitate healing and prevent cicatrisation or collapse.[5] The mechanism of stents is at molecular level wherein anchoring the wound matrix to the dermal margin that promoted survival of the cells in the granulation tissue. Studies by Chipev et al., concluded that the fibroblasts at glabrous sites do not promote keloid formation consistent with an earlier reduction in cellularity, necessary for a normal wound healing. It is noteworthy that tension/mechanical loading is exerted through the ECM by fibroblasts expressing a "synthetic" fibroblast phenotype to promote keloid formation at glabrous sites.[6]

Clinical applications of stents include: Relief wound bed tension and to prevent aberrant scar formation during burn wound healing or reconstructive surgeries. Comparisons of non-pressure *vs*. pressure-treated contracture wounds have shown that pressure supports the disappearance of α-SMA expressing myofibroblasts that causes the wound contracture. Thus, interdigital stent used in dynamic mode for 9 weeks helps creating the positive wedge—tension over the contracture wound leading to the redirection of the myofibroblasts growth preventing the wound contracture. The static stent then allowed maintenance of the web space and promote healing in the desired size, shape and interdigital distance.

The serial radiographic evaluation showed improvement in the wound healing **(Fig. 1.11)**. Finger mobility was checked by asking the patient to perform functions and range of motion was analyzed by using a goniometer.

CONCLUSION

The presented treatment demonstrates an interdisciplinary approach where stents served as a valuable adjunct to surgical procedures by providing the structural support, facilitating tissue separation, reducing wound contracture, enhancing functional and aesthetic results. Continued research and refinement of stent designs and surgical protocols will undoubtedly further enhance its application widely.

Queries Raised During Discussion

1. **What are all the clinical conditions where stents can be used?**
2. **What is the mechanism of the stents?**
3. **What are all the factors that affect the stent's outcome?**

Answers for Queries

The mechanism of stents is at molecular level, wherein it creates a wedge type pressure in the healing site and therefore prevents contracture. Stents are widely used in alliance with plastic and reconstructive surgery department as an aid in healing in the desired direction, shape and angulation like after otoplasty, burn or chemical injuries, revision rhinoplasty, sulcoplasty cases. Patient's compliance is the main factor in deciding the outcome.

Take Home Points

- Mechanism of the stents
- Stents: Prosthodontic adjuncts

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