

## ESTHETIC AND FUNCTIONAL OUTCOMES OF A POST-ANKYLOSED CASE – AN INTERDISCIPLINARY APPROACH: USE OF STAINLESS STEEL SURGICAL SCREWS FOR ORTHODONTIC ANCHORAGE CONTROL IN AN ADULT PATIENT

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### ABSTRACT

*The use of stainless steel (SS) surgical screws as a suitable alternative to titanium implants for anchorage control in the orthodontic treatment of a 17 year old female patient has been reported. The patient gave history of trauma related bilateral TMJ ankylosis that had been released earlier. She had the stigmata of the ankylotic face presenting as bimaxillary proclination on a skeletal Class II jaw base with retrognathic mandible, typical bird face, increased over bite and overjet and multiple missing teeth resulting in disturbed occlusion and poor esthetics. The rigid anchorage obtained allowed for dental correction. Esthetics and function was improved after active orthodontics; by genial augmentation and prosthetic replacement of missing teeth.*

*Our results suggest that SS mini screws which are extremely cost-effective and readily available can successfully be used as an alternative to expensive titanium mini implants for orthodontic anchorage. This could have significant implications in other developing countries.*

### INTRODUCTION

Anchorage control is fundamental to successful orthodontic treatment<sup>1</sup>. Orthodontic tooth movement is limited by action-reaction reciprocal force mechanics in anchorage control<sup>2</sup>. The use of osseointegrated titanium implants<sup>3,4</sup> is well established. They are also used to extrude impacted teeth<sup>5</sup> and to retract anterior teeth<sup>6</sup>. They are effective in orthodontic tooth movement and as support for prostheses<sup>7</sup> because they provide maximal anchorage independent of patient cooperation as needed for extra oral anchorage<sup>8, 9,10,11</sup>.

For the correction of severe Class II skeletal problems, as in post ankylotic deformities, extensive orthognathic surgery may be required. The post ankylotic adult patient with severe facial deformities is still a common problem in developing countries. However, multiple operations are often required and some avoid this because of fatigue, added risks, cost, or other factors. For such patients, various compromise alternatives can be used, including multibrackets in conjunction with headgear therapy<sup>12</sup>, nickel-titanium wire and intermaxillary elastics. These techniques can provide acceptable inter-incisal relationships, decreased

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overbite and overjet. However, the skeletal and/or dentofacial improvements are often poor because it is difficult to establish absolute anchorage by traditional orthodontics alone. In order to obtain absolute anchorage, dental implants<sup>6,7,11,13</sup> screws<sup>9,14</sup> and miniplates<sup>15,16</sup> have been used. Even in non-compliant patients these can provide stable anchorage for various tooth movements. The present case report demonstrates the effectiveness of routinely available, simple, SS surgical miniscrews used as a substitute for costly titanium mini implants for orthodontic anchorage control in an adult patient with the complex dentofacial stigmata of early onset TMJ ankylosis and who had subsequently undergone major reconstructive surgical procedures.

## CASE REPORT

A 17 years old female patient from Larkana, Pakistan came to the outpatient clinic of Hamdard University Dental Hospital in November 2003. Her chief complaint was poor esthetics related to the proclination of upper anterior teeth. A convex profile due to a retrognathic mandible and typical bird facies was noted. **Figure 1** She gave a history of trauma in childhood resulting in bilateral TMJ ankylosis which had been released in 1996 by one of the authors (MMH).

The patient exhibited decreased lower facial height and an incomplete deep bite. She had limited mouth opening with an inter-incisal distance of 28mm and restricted lateral movement. There was a Class I molar relationship on the left side while the mandibular molars were missing on the right side. Upper arch was "V" shaped. The lower dental midline almost coincided with the facial midline, but the upper dental midline was not coincident because of the missing central incisor. **Figure 2** She had extremely poor oral hygiene. Panoramic radiographs revealed multiple missing teeth: 16, 18, 21, 28, 35, 44, 46, 47, and 48. (FDI notation). The 17, 26 and 41 were carious. **Figure 3** (We have been unable to trace her pre treatment intraoral photographs).

Cephalometric analysis showed a severe skeletal Class II relationship with mandibular retrusion. The upper and lower lips were protruded relative to the E-line. **Table I.**

A diagnosis was made of bimaxillary proclination with multiple missing teeth, a severe skeletal Class II

jaw base relationship, decreased lower facial height, deep bite and incompetent and protrusive lips.

## Figure 4.

## TREATMENT OBJECTIVES

Given her severe deformities the desirable objectives were: (1) correction of bimaxillary protrusion (2) to reduce deep overbite and overjet (3) to get an acceptable functional occlusion, and (4) to correct the convex appearance of the facial profile.

## TREATMENT PLAN AND PROGRESS

Since she was unwilling for more complex surgery a compromise treatment plan was instituted. Before the start of orthodontic treatment oral hygiene measures were instituted and the carious teeth were restored. Through a muco-alveolar round bur drill hole two SS mini screws (Synthes; 2mmØ, 7 mm length) were inserted under local anesthesia 5mm apart in the mandibular right 1st molar region. Composite core buildup in a molar band was done over a piece of rubber dam fitted over the screw heads. **Figure 5.**

Pre-adjusted edgewise appliances were placed in both arches. After leveling and alignment with nickel-titanium arch wires, stainless steel arches were placed and the anterior teeth were retracted by Class II traction. Over bite was corrected by using reverse curves in the arch wires.

Towards the end of incisor relationship correction sliding augmentation genioplasty was done to improve the facial profile. The upper left central incisor space was closed by pulling up the lateral incisor and the canine. The repositioned upper left lateral incisor was built up with composite to resemble a central incisor and the upper left cuspid was reshaped to a lateral incisor form. These procedures combined with the orthodontic treatment achieved an excellent overall appearance. Active treatment is nearly over and the upper arch will be stabilized with a removable retainer, while the lower arch will be stabilized with a cast partial denture.

## RESULTS

The post treatment photographs show a dramatic change in the facial profile when compared with the pre-treatment photographs. The retrognathic chin and



Fig. 1. Pretreatment facial photographs.



Fig. 2. Pretreatment dental models.

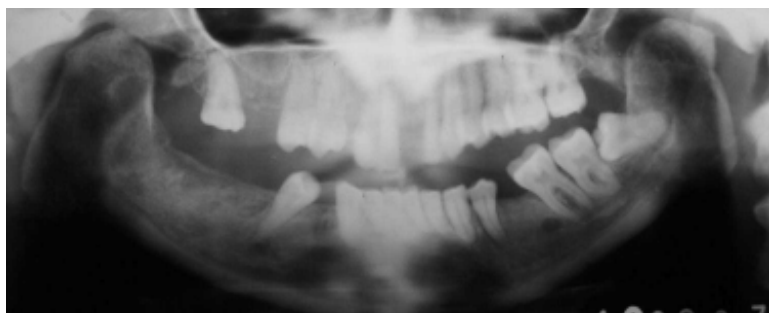


Fig. 3. Pretreatment panoramic radiograph.

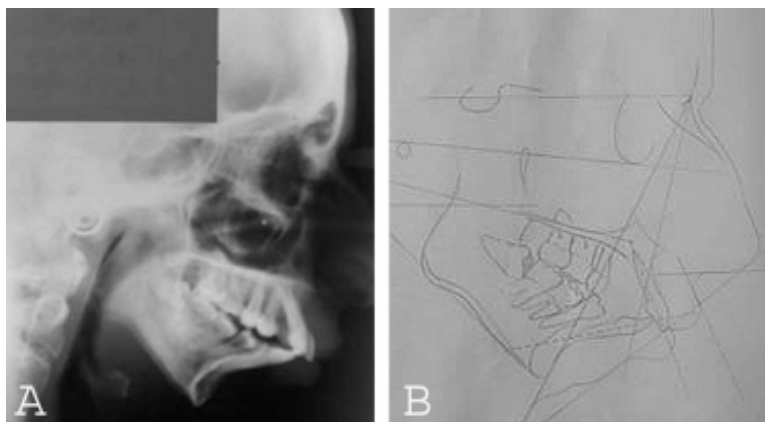


Fig. 4. Pretreatment lateral cephalometric radiograph and tracing.

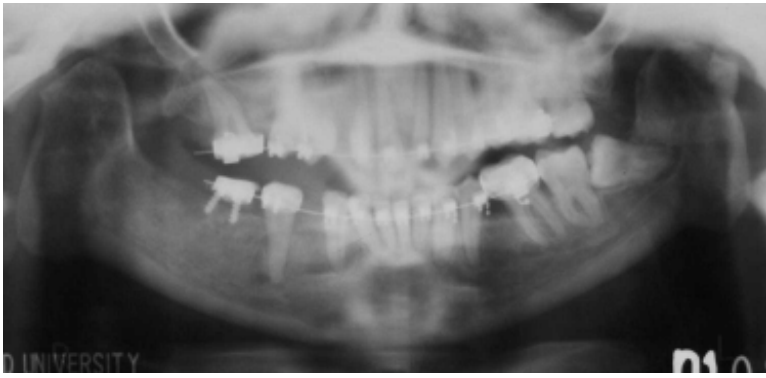


Fig. 5. Mid treatment panoramic radiograph.

Fig. 6. Post genioplasty facial photographs.

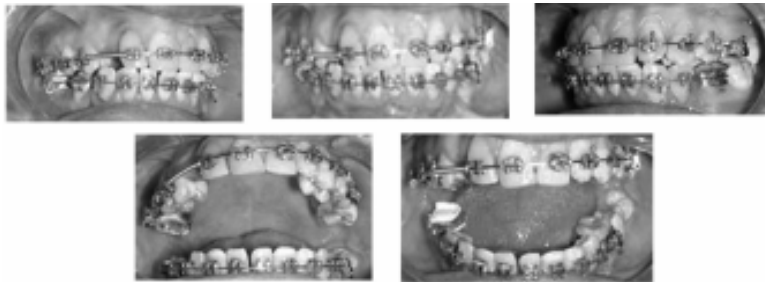
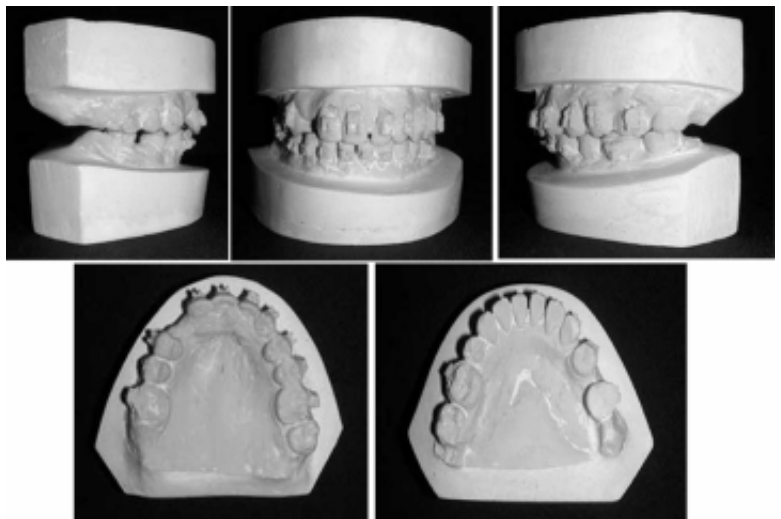


Fig. 7. Post active orthodontic treatment intraoral photographs.

Fig. 8. Post active orthodontic treatment dental models



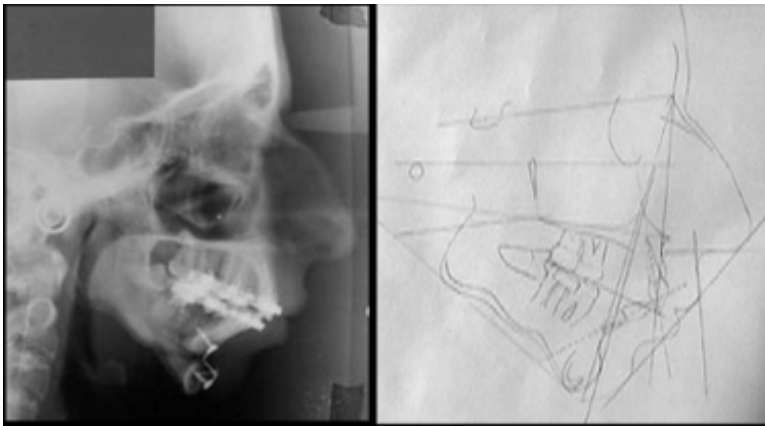


Fig. 9. Post active treatment lateral cephalometric radiograph and tracing

TABLE 1: PRE AND POST TREATMENT READINGS OF VARIOUS CEPHALOMETRIC PARAMETERS

| Variables          | Normal Range      | Before treatment | After treatment |
|--------------------|-------------------|------------------|-----------------|
| <b>SKELETAL</b>    |                   |                  |                 |
| SNA                | $82 \pm 2^\circ$  | $79^\circ$       | $79^\circ$      |
| SNB                | $78 \pm 2^\circ$  | $67^\circ$       | $69^\circ$      |
| ANB                | $2 \pm 2^\circ$   | $12^\circ$       | $10^\circ$      |
| FA                 | $87 \pm 3^\circ$  | $72^\circ$       | $77^\circ$      |
| SNMP               | $32 \pm 4^\circ$  | $44^\circ$       | $49^\circ$      |
| Mcnam-A            | $1 \pm 2$ mm      | 6 mm             | 2 mm            |
| Mcnam-Pog          | $-3 \pm 4$ mm     | 33 mm            | 24 mm           |
| <b>DENTAL</b>      |                   |                  |                 |
| U1-SN              | $102 \pm 4^\circ$ | $109^\circ$      | $89^\circ$      |
| L1-Man             | $90^\circ$        | $126^\circ$      | $112^\circ$     |
| U1/L1              | $125-135^\circ$   | $83^\circ$       | $110^\circ$     |
| U1-NA(mm)          | $4 \pm 2$ mm      | 9 mm             | 2 mm            |
| U1-NA              | $22^\circ$        | $29^\circ$       | $9^\circ$       |
| L1-NB(mm)          | $4 \pm 2$ mm      | 19 mm            | 12 mm           |
| L1-NB              | $25^\circ$        | $55^\circ$       | $49^\circ$      |
| <b>SOFT TISSUE</b> |                   |                  |                 |
| UL-E Line          | $-3 \pm 2$ mm     | 6 mm             | 0 mm            |
| LL-E Line          | $-2 \pm 2$ mm     | 9 mm             | 2 mm            |
| Nasiolabial        | $90-110^\circ$    | $73^\circ$       | $102^\circ$     |

convex profiles have improved with genioplasty. **Figure 6** The dental midline now corresponds with the facial midline. Mentalis strain was reduced improving her chin and lower lip position which now overlaps the upper incisal edges- a factor to maintain upper incisor stability. **Figure 7**

Her smile is enhanced by the corrected incisors. A fixed prosthesis will replace the upper left canine. We

have achieved good functional occlusion and satisfactory esthetics. The implants remained functional throughout treatment. **Figure 8**

The post active treatment lateral cephalometric radiograph confirms the largely soft tissue and dentoalveolar changes that were achieved **Figure 9, Table I**

## DISCUSSION

In developing countries like Pakistan many patients who have suffered from facial trauma present late, with severe dentofacial deformities, as they are unable to access or afford early preventive or corrective treatment. Further, as in the present case, they have limited finances to bear the additional high costs involved in subsequent corrections of the residual dentofacial problems. This case had some problems specific to post ankylotic patients<sup>17</sup>: limited mouth opening, dense deformed bone, impactions or severe malocclusions, multiple missing teeth removed due to pulpal pain, and many carious lesions.

Subsidized orthodontics was done at our teaching dental hospital. Instead of expensive 1.8mmØ titanium mini implants we used 2mm Ø SS surgical screws as successful and cost effective substitutes for the absent molars<sup>18</sup>. Stainless material is not bioinert like titanium but is bitolerant, nontoxic and provides resistance to stress, strain, and corrosion. SS surgical screws are also more easily available than titanium in many centers. Core buildup in the molar band provided successful, stable, anchorage throughout active treatment despite the relative shortness of the flared screws.

Various methods to achieve stable orthodontic anchorage have been reported earlier. Standard dental implants resist the reciprocal action of tooth move-

ment acting as an ankylosed tooth, but require complicated surgery for both placement and replacement and also involve higher medical costs<sup>6,7,11,12,13</sup>. Conventional dental implants and 1.8mm Ø titanium mini implants both provide rigid anchorage against orthodontic loads. However the latter have the added advantages of minimal anatomic limitation for placement, simpler placement surgery, and less discomfort after implantation<sup>9,10,14,18</sup>.

As most changes occurred at the dentoalveolar level rather than through the skeletal bases the cephalometric values were not significantly changed. **Table I** However, a simple genioplasty improved the convex facial profile. It has also helped in reducing circum-oral musculature strain and increased the prominence of the chin.

## CONCLUSION

In developing countries a significant proportion of patients requires complex treatments but has limited financial resources. In this specific case despite compromises, successful surgical, restorative and prosthetic rehabilitation was effected. The complex orthodontics was possible with rigid anchorage control that required no specialized materials or equipment and was highly cost effective.

Alignment and correction of the underlying problems were achieved with the intraoral SS screws anchorage with no adverse side effects and without relying on patient cooperation. Our experience suggests that the simple SS surgical screw anchorage method serves the same purpose as a much more expensive and difficult to obtain titanium mini implant in the developing countries and may have wider usage possibilities in orthodontic anchorage control.

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