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ORIGINAL ARTICLE

# Use of oral screen for preventing soft tissue injuries associated with use of arch bars: a prospective randomized clinical study

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## Abstract

**Purpose** The purpose of the present study was to access the efficacy of oral screen in protection of arch bar-induced soft tissue injury after achieving maxillomandibular fixation (MMF).

**Materials and methods** This study is a randomized clinical trial. The study sample was derived from the population of patients who required MMF and reported from January 2017 to December 2017. A total of 60 patients in whom application of an Erich arch bar was indicated for MMF were selected for the study. The patients were divided into two groups. In group I, only MMF was done; however, in group II, oral screen was used after MMF. The patients were assessed for soft tissue injury, pain, and maintenance of oral hygiene. All parameters were compared statistically using the chi-square test and Student's *t* test.

**Results** The soft tissue injury in group I (73.33%) was greater than that in group II (3.33%). The pain was worse in group I than in group II. The mean value of plaque index in group II is 1.20 and in group I is 2.89. It signifies that plaque deposition was more in group I.

**Conclusion** Soft tissue injury and pain were less, as well as oral hygiene maintenance is better in patients who used oral screen after the placement of Erich arch bars.

**Keywords** Arch bar · Oral screen · Maxillomandibular fixation · Soft tissue injury

## Introduction

Gurnell E. Hammond [1] is accredited for devising the first arch bar in 1871 by placing a steel wire around dental arch and fixing it with twisted dental wires. Since then, arch bars and wires were commonly used for achieving maxillomandibular fixation (MMF) for closed treatment of some mandibular fractures and during open reduction and internal fixation (ORIF) of jaw fractures. The commonly recommended protocol in closed treatment of jaw fractures which required MMF for 3 to 4 weeks, followed by elastics placement in case of condylar fracture for 1 or 2 weeks more [2].

These wires can cause irritation to the mucosa and sometimes its laceration. Furthermore, arch bars can compromise gingival health [3] and wires can sometimes cause injury to labial and buccal mucosa. This study was designed to identify the role of oral screen in preventing arch bars-induced soft tissue injury and to compare the influence of oral screen on postoperative pain and maintenance of oral hygiene after placement of Erich bars (Dentaurum's Barres Erich Arch Bars, Germany) for MMF.

## Materials and methods

This study was a randomized clinical trial. Approval for the present study was obtained from Experimental Medical

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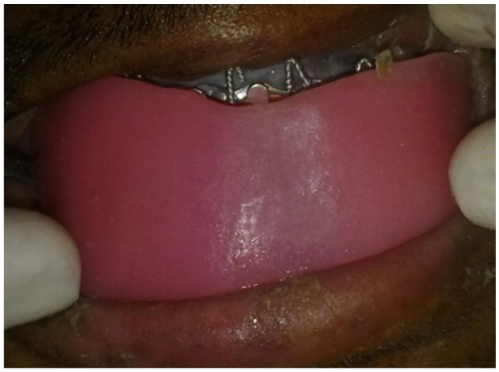

**Fig. 1** Photograph showing patient wearing oral screen over arch bars

**Fig 3** Photograph showing soft tissue injuries caused by arch bar wires

Research and Practicing Center Ethical committee. Informed consent was obtained from all patients who were enrolled in the study. The study sample was derived from the population of patients who reported between January 2017 and December 2017 indicated for MMF. The criteria for the inclusion in this study were patient aged 18 years or older and minimally displaced favorable fractures of mandible and maxilla that required closed reduction.

Patients with dentoalveolar fracture, pan facial fractures, comminuted fractures of the mandible, and presence of systemic conditions like rheumatoid arthritis, and bronchial asthma. were excluded from this study.

The patients were evaluated in this study for the following variables:

1. The use of oral screen in protection of arch bar-induced soft tissue injury.
2. Pain in both groups were assessed by visual analogue scale.
3. The plaque accumulation in both groups was evaluated by using Turesky–Gilmore–Glickman modification of the Quigley–Hein Plaque index.

The patients were divided into two groups. In group I, the patients were kept in MMF without the use of acrylic oral screen; however, in group II, oral screen was used following application of arch bar and achieving MMF. Follow-up examinations were performed on 1, 3, 7, 14, 21, and 28 postoperative days.

In both groups, MMF was achieved using pre-fabricated Erich arch bars. In patients with complete dentition, it was extended on both sides up to the second molar and in case of deficient number of teeth, third molars were also included. Twenty-four gauze stainless steel wires were used to secure the arch bar to the teeth, while a 26

**Fig. 2** Photograph showing soft tissue injuries caused by arch bar wires

**Fig. 4** Photograph showing soft tissue injuries caused by arch bar wires

None Mild Moderate Severe Worst

**Fig. 5** Vas scale

gauze stainless steel wire was used for achieving MMF. All the patients were operated by the surgeon who was blinded to the randomization of subjects in different groups eliminating the operator bias.

Impressions of both arches were taken before the application of arch bars and upper and lower arch casts were prepared. Subsequently, an acrylic oral screen was fabricated on this cast and placed intraorally (Fig. 1).

## Soft tissue injury

Soft tissue injury (Figs. 2, 3, and 4) in the form of laceration, arch bar impingement was noted on the labial and buccal mucosa of both maxillary and mandibular soft tissue after every week for minimum of 4 weeks, and any injury that has been occurred was recorded.

## Pain

Pain was noted on postoperative days 1, 3, 7, 14, 21, and 28. Pain was evaluated by the patient on a daily basis until the patient was pain free using a visual analogue scale (VAS) calibrated from 0 to 10, with 0 as no pain, 1–3 as mild pain, 4–6 as moderate pain, 7–9 as severe pain, and 10 as worst pain. To facilitate the use of VAS by the patients, the end points were marked as "no pain" and "worst pain." To facilitate the use of VAS by the patients, legends were placed over different parts of the scale as shown in Fig. 5.

**Table 2** Soft tissue injury in both groups

| Groups ($n = 30$) | Soft tissue injury in patients | Percentage |
|---|---|---|
| I | 22 patients | 73.33% |
| II | 1 patient | 3.33% |

## Oral hygiene

It was assessed by Turesky–Gilmore–Glickman [4] modification of the Quigley–Hein Plaque index. Plaque was assessed on the labial, buccal, and lingual surfaces at the gingival third of all the teeth using a disclosing agent in both groups. The index is based on the numerical scale of 0 to 5.

Statistical analysis was performed by a statistician with SPSS statistical software for windows, version 8.0 (SPSS, Inc., Chicago, IL) using the chi-square test and Student's *t* test.

# Results

Of the 60 patients involved, 53 were men and 7 were women, with a mean age of 26 years. All patients remained in MMF postoperatively with 26-gauge wire for 4 weeks, and those patients with condylar fractures were later transitioned to guiding elastics for 2 weeks. The etiology of fractures in three cases was assault; 38 fractures were due to road traffic accidents and 19 due to fall. The study variables and treatment assigned to them are shown in Table 1. Table 2 showing soft tissue injury was more in group I in whom oral screen was not used. The mean value of plaque index of both groups is shown in Table 3 and the result signifies that plaque deposit was more in group I. Statistical analysis using the chi-square test revealed significant difference ($p < 0.05$) in the number of patients reporting with pain in both groups on 1, 3, 7, 14, 21, and 28 postoperative days (Table 4).

**Table 1** Study variables and treatment assigned to them

| Study variables | Group I | Group II | Total | Treatment given to patients |
|---|---|---|---|---|
| Condylar fracture | 19 | 16 | 35 | Closed reduction (CR) |
| Parasymphysis +Condylar fracture | 10 | 8 | 18 | ORIF for parasymphysis and CR for condylar fracture |
| Symphysis +Condylar fracture | 1 | 6 | 7 | ORIF for symphysis and CR for condylar fracture |

**Table 3** Mean value of plaque index of both groups

| Group | *n* | Mean | *p* value |
|---|---|---|---|
| I | 30 | 2.89 | 0.000 |
| II | 30 | 1.20 | S, $p < 0.05$ |

## Discussion

The goal of this study was to identify the role of oral screen in preventing arch bars and wires induced soft tissue injury and to compare the influence of oral screen on postoperative pain and maintenance of oral hygiene after placement of Erich arch bars. The result of this study confirmed that the use of oral screen after placement of arch bars not only prevents soft tissue injury but also reduces postoperative pain and oral hygiene maintenance was better.

The mean plaque index value is higher in group I which suggests that oral hygiene maintenance is easy when oral screen was used in the patients in group II. As accepted by several authors in the literature, oral hygiene is difficult to maintain when arch bars and eyelets are used for maxillomandibular fixation [5]. One of the reasons by which the maintenance of oral hygiene is better in group II was that at the time of intake of liquid diet, patients had to remove the oral screen, and all the patients are instructed to clean the oral screen and rinse the mouth with chlorhexidine.

To protect the oral mucosa of the cheeks and lips, Ayoub and Rowson [6] applied soft wax on the edges of the arch bars. But this technique covered only the edge and precluded the other surfaces. We recommend the use of oral screen coverage over the wires to protect the labial and buccal mucosa. Only 3.33% of the patients in group II had soft tissue injuries and that too caused due to the edges of the oral screen, as compared to 73.33% in group I. These injuries are not permanent, and all are resolved after removal of the arch bars, but they cause discomfort to the patients.

No severe pain was experienced by any patients in group II, and patients were very comfortable with the use of oral screen. Prolonged MMF has been criticized for pain, poor oral hygiene, phonetic disturbance, loss of effective work time, weight loss, reduced masticatory efficiency, and reduced mouth opening [7–9]. Patients reported considerable difficulty in maintaining oral hygiene measures with arch bar fixation, leading to associated periodontal problems [6].

Use of oral screen is simple and cheap method. Patient can wear it whole day and even in the night time and is required to remove it only at the time of taking the liquid diet. To our knowledge, no prospective study has compared the use of oral screen after achieving the MMF, which makes the present study unique. The small sample size and limited follow-up could be considered the limitation of the study. This study focuses on the use of conventional arch bars where wires are used to secure arch bars, as with the use of hybrid MMF, the wire issues are not significant. Some operators use wax to cover the twisted wires which also prevent injuries caused by wires. A study comparing the use of wax and oral screen is recommended.

**Table 4** Pain experienced by the patients in both groups

| Postoperative day | Group ($n = 30$) | Pain experienced by the patient | | | | | |
|---|---|---|---|---|---|---|---|
| | | None | Mild | Moderate | Severe | $X^2$ | *p* |
| 1 | I | 0 | 10 | 12 | 8 | 16.60 | 0.0009 |
| | II | 5 | 18 | 7 | 0 | | S, $p < 0.05$ |
| 3 | I | 0 | 14 | 9 | 7 | 21.95 | $p < 0.0001$ |
| | II | 10 | 18 | 2 | 0 | | Significant |
| 7 | I | 0 | 15 | 10 | 5 | 27.27 | $p < 0.0001$ |
| | II | 12 | 18 | 0 | 0 | | Significant |
| 14 | I | 0 | 8 | 10 | 2 | 34.91 | $p < 0.0001$ |
| | II | 20 | 10 | 0 | 0 | | Significant |
| 21 | I | 0 | 18 | 8 | 4 | 35.60 | P < 0.0001 |
| | II | 22 | 6 | 2 | 0 | | Significant |
| 28 | I | 6 | 18 | 6 | 0 | 33.04 | $p < 0.0001$ |
| | II | 28 | 2 | 2 | 0 | | Significant |

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical approval** Ethical clearance was taken from Institutional Ethics Committee.

**Informed consent** No patient identifying photographs are included.

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