

Research Article

Pain Experience in Dental Implant Patients with High and Moderate Insertion Torques (Clinical Prospective Standardized Blinded Study)

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ABSTRACT

Behind every hesitation there is an obstacle and one of the major obstacle for dental implant procedure is pain. Patients recommended to replace their missing teeth with minimal invasive procedures that's makes them very hesitated to request dental implant'. Knowledge about pain experience would help in appropriate selection of analgesics which decreases post-operative human suffering. This study was conducted between October 2019 and August 2020. Twenty patients were participated and continued up to the end of the study. After completion of osteotomy bed, implant inserted with motorized engine and insertion torque was observed and recorded. Manual wrench was used to help in complete implant seating. Patients were followed up to seven days after surgery. Sever score was 60% of cases with high insertion torque and 10% in low insertion torque. There is significant difference in pain experience in study and controlled group with p value 0.004 and pain decrease as the time elapsed.

Keywords: health; treatment; dental implant; clinical treatments**INTRODUCTION**

Pain is well known as a subjective sensation annoying both the victim and his/ her family. From historical point of view, giants ancient Greece Plato and his student Aristotle regarded pain as not to be an experience instead, to be an emotional one. Archaic cultures had established one among the earliest idea about pain which hypothesize it as entry of demons or evil spirits through injuries. Ancients traditions considered pain as of God work as a type of punishment and that why the word pain was derived from the Latin word "poena" which means penalty or even a test of faith⁽¹⁾. Different tools were used to assess pain in medicine including pain analogue scale, numerical rating, verbal rating and others in an attempt to evaluate the degree of patient complain with the appropriate treatment delivery⁽²⁾. As the new advancement in dentistry was the use of endosseous implants to anchor prosthesis, still pain represented a great obstacle prohibiting patient from making step forward toward implant placement⁽³⁾. Since different pain grades require different analgesics potency, this study attempted at evaluating pain experience in patients submitted to dental implant placement with moderate and high torque situations that may

pave the way for proper selection of analgesic potency for different torques in the future.

MATERIAL AND METHOD**Materials**

This study is conducted in private clinic in Basra province between October 2019 and August 2020 in which thirty-five patients were participated their ages range between 18-65 years. Inclusion criteria involved patients with straight forward implant placement according to SAC classification in different jaw regions⁽⁴⁾ and patients with adequate teaching levels that were either recently finished their secondary school, college students or graduated from college or institute to ensure good response to the motivation and education on the pain grading system used. Any patient with systemic condition that compromise normal bone healing or the surgical procedure itself was excluded from the beginning. Patients who required advanced or complicated procedures, or with neural disturbance are also deferred from the study. Patient's informed consents were signed preoperatively involving the acceptance for the implant placement and the participation in this research. At the end of this study fifteen patients were excluded for not responding to follow up or

the insertion torque being between 35-50 Ncm. The remaining twenty were classified into two groups the 10 of them in the study group when the insertion torque is above or equal to 50Ncm and 10 in controlled group when insertion torque is equal or less than 35 Ncm.

Dental implants of dentium Korea were used with new surgical implant kits (five in number) were utilized to help appropriate judgment regarding bone density depending on tactile sense⁽⁵⁾ and on orthopantomograppgy by Leckolm and Zarb in

1985 study⁽⁶⁾. Efficient irrigation system was ensured especially in high torque situation to avoid bone burning by hand piece cooling and external cooling. Numerical rating system was depended starting with zero representing no pain to 10 which represents the most intense one. Patients were well motivated and educated about the appropriate rating with 1-3 mild pain; 4-6 moderate pain and 7-10 for severe pain⁽⁷⁾, figure (1).

Pain scale form

Date / /

| Name: | Age: | Gender | Occupation | Phone number |
|-------|------|--------|------------|--------------|
|-------|------|--------|------------|--------------|

Medical history

| | |
|------------------------|---|
| General health | Medication |
| Bone healing potential | <input type="checkbox"/> BHP1 <input type="checkbox"/> BHP2 <input type="checkbox"/> BHP3 |

**Pain scale 0 represents no pain.....10 represent severest pain
1-3 mild pain, 4-6 moderate, 7-10 sever pain**

| | | |
|------------------|--|----------------------|
| Pain score day 1 | | <input type="text"/> |
| Pain score day 2 | | <input type="text"/> |
| Pain score day 3 | | <input type="text"/> |
| Pain score day 4 | | <input type="text"/> |
| Pain score day 5 | | <input type="text"/> |
| Pain score day 6 | | <input type="text"/> |
| Pain score day 7 | | <input type="text"/> |

Patients name and signature

Fig 1: Special formula related to the research.

Method of motivation and data records

Patients were motivated about their pain assessment and then asked many questions to ensure well understanding and informed to keep their phones nearby to answer calls at time during the follow up period which started one day post-

surgery up to 7 day. Extensive flap design (three sided flap with papillary involvement) under local anesthesia. Appropriate drilling sequence is followed according to manufacturer to obtain optimal osteotomy dimensions, see figure (2).



Fig 2: pilot drill to mark initial osteotomy.

Implants were inserted using motorized hand piece with its monitor visible to a second operator only, see figure (3).

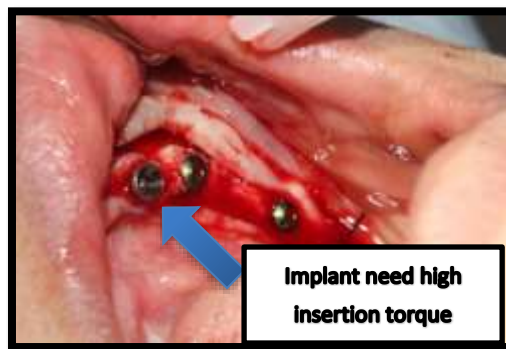


Fig 3: implants were inserted with motorized hand piece with one of them is not completely seated.

Insertion torque then recorded by the second operator to avoid unnecessary bias. Once torque was not enough for complete implant seating, reverse torqueing and implant removal, then the

second operator rise the torque until seating, few remaining threads are pushed to their bed with manual wrench with obvious calibration to mark the torque utilized, figure (1.4).

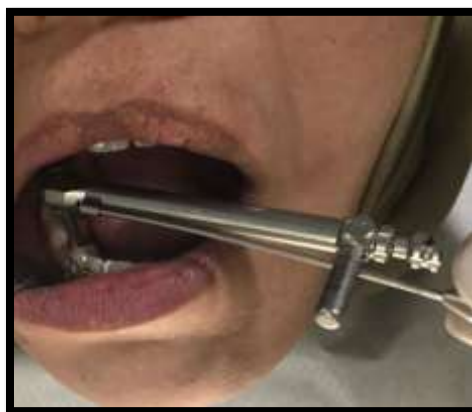


Fig 4: Showing the use of manual wrench to seat implants to their final position

Postoperative instructions verbal and written one were delivered. Postoperative amoxicillin capsule 500 mg three times per day for 7 days (no patient with penicillin allergy was confronted), oral

paracetamol tablets 500 mg three times per day for 7 days with chlorhexidine 0.12% mouth wash twice per day for 5 days were prescribed.

Standardization criteria

1. Patients selected are with adequate teaching levels to ensure good understanding of their proper assessment to their pain and to avoid careless answers.
2. Patients selected are with no history or clinical signs and symptoms of systemic diseases and with straight forward implant placement.
3. Patients within controlled group are with insertion torque below 35 Ncm and those within study group above 50 Ncm.
4. Implant system used is from dentium korea.
5. Orthopantomograph is requested for all patients preoperatively and postoperatively.
6. All prescriptions involve with Amoxicillin 500mg and paracetamol 500mg three time per day and clorehexidine 0.12% two times per day up to 5 days.

Research parameters

Torque of insertion
Pain grade at day 1, 2, 3, 4, 5, 6 and 7

Statistical analysis

Descriptive statistics as number, percentage, median and mean rank cluster and line graphs, statistical tests are Wilcoxon sum rank test and Friedman test followed by multiple Wilcoxon sign rank test adjusted by Dunn-Bonferroni method while the statistical test of distribution is chi-square and Fisher exact test.

RESULTS

In this clinical prospected and standardized study 35 patients were participated with 15 of them then excluded to ensure standardization and to give rise to valuable results regarding torque effect on pain experience. The remaining 20 patients were divided into two groups study and controlled with aged ranged between 18-65 year's old and mean \pm standard deviation (36 ± 14.053). Implant length of 10 mm and width 3.4mm is the mostly used dimensions, see table 1. Most of patients encountered with dental implants placed in posterior mandible, see table 2.

Table 1: show the distribution of dental implant length and width

| | | | |
|----------------|-----|----|-------|
| Implant length | 8 | 8 | 22.86 |
| | 10 | 14 | 40.00 |
| | 12 | 11 | 31.43 |
| | 14 | 2 | 5.71 |
| Implant width | 3.4 | 16 | 45.71 |
| | 3.8 | 11 | 31.43 |
| | 4.3 | 8 | 22.86 |

Table 2: shows distribution of dental implants in different jaws regions.

| Regions | | NO. | % |
|--------------------|-------|-----|-------|
| Anterior maxilla | 1.00 | 15 | 75.0 |
| | 2.00 | 4 | 20.0 |
| | 3.00 | 1 | 5.0 |
| | Total | 20 | 100.0 |
| Posterior maxilla | 1.00 | 14 | 70.0 |
| | 2.00 | 3 | 15.0 |
| | 3.00 | 1 | 5.0 |
| | 4.00 | 2 | 10.0 |
| | Total | 20 | 100.0 |
| Anterior mandible | 1.00 | 19 | 95.0 |
| | 2.00 | 1 | 5.0 |
| | Total | 20 | 100.0 |
| Posterior mandible | 1.00 | 12 | 60.0 |
| | 2.00 | 3 | 15.0 |
| | 3.00 | 4 | 20.0 |
| | 4.00 | 1 | 5.0 |
| | Total | 20 | 100.0 |

Sever pain scores are only noticed within study group with greatest number in the first day being observed in 6 cases accounting 60% of cases within this group and reduced with time while moderate and mild pain scores are observed

among both groups, table 3. There is no significant difference regarding age and gender on pain experience among study and controlled group (p value 0.650 and 0.350 respectively), table 4 and 5.

Table 3: shows pain scores with time among study and controlled group.

| Groups | Days | Severity | | | | | | | |
|---------|------|----------|----|------|----|----------|----|--------|----|
| | | 0 | | Mild | | Moderate | | Severe | |
| | | NO. | % | NO. | % | NO. | % | NO. | % |
| Study | 1 | 0 | 0 | 0 | 0 | 4 | 40 | 6 | 60 |
| | 2 | 0 | 0 | 1 | 10 | 5 | 50 | 4 | 40 |
| | 3 | 0 | 0 | 2 | 20 | 5 | 50 | 3 | 30 |
| | 4 | 1 | 10 | 3 | 30 | 6 | 60 | 0 | 0 |
| | 5 | 2 | 20 | 3 | 30 | 5 | 50 | 0 | 0 |
| | 6 | 2 | 20 | 7 | 70 | 1 | 10 | 0 | 0 |
| | 7 | 3 | 30 | 6 | 60 | 1 | 10 | 0 | 0 |
| Control | 1 | 0 | 0 | 3 | 30 | 6 | 60 | 1 | 10 |
| | 2 | 0 | 0 | 3 | 30 | 6 | 60 | 1 | 10 |
| | 3 | 0 | 0 | 6 | 60 | 4 | 40 | 0 | 0 |
| | 4 | 0 | 0 | 7 | 70 | 3 | 30 | 0 | 0 |
| | 5 | 1 | 10 | 8 | 80 | 1 | 10 | 0 | 0 |
| | 6 | 3 | 30 | 6 | 60 | 1 | 10 | 0 | 0 |
| | 7 | 4 | 40 | 6 | 60 | 0 | 0 | 0 | 0 |

Table 4: percentages of ages within each group and between both groups

| | | Groups | | Fisher exact test | P-value | Total |
|------|----------------|--------|---------|-------------------|-------------|--------|
| | | Study | Control | | | |
| <=36 | NO. | 5 | 7 | 0.833 | 0.650 NS | 12 |
| | % within Age | 41.67 | 58.33 | | | 100.00 |
| | % within Group | 50.00 | 70.00 | | | 60.00 |
| | % T | 25.00 | 35.00 | | | 60.00 |
| 36+ | NO. | 5 | 3 | 0.833 | 0.650 NS | 8 |
| | % within Age | 62.50 | 37.50 | | | 100.00 |
| | % within Group | 50.00 | 30.00 | | | 40.00 |
| | % T | 25.00 | 15.00 | | | 40.00 |

Table 5: percentages of gender within each group and between both groups

| | | Groups | | Fisher exact test | P-value | Total |
|---------|-----------------|--------|---------|-------------------|-------------|--------|
| | | Study | Control | | | |
| Males | NO. | 2 | 5 | 1.978 | 0.350 NS | 7 |
| | % within Gender | 28.57 | 71.43 | | | 100.00 |
| | % within Group | 20.00 | 50.00 | | | 35.00 |
| | % T | 10.00 | 25.00 | | | 35.00 |
| Females | NO. | 8 | 5 | 1.978 | 0.350 NS | 13 |
| | % within Gender | 61.54 | 38.46 | | | 100.00 |
| | % within Group | 80.00 | 50.00 | | | 65.00 |
| | % T | 40.00 | 25.00 | | | 65.00 |

Results showed pain to remain higher among study group than controlled one which is significant (P value 0.004) during the first day

while the difference become less as the time elapsed on the next and became non-significant

with the overall pain is reduced with time in both groups, table 6, 7 and figure 1.

Table 6: showed median and mean rank of pain during the first 7 days after surgery between study and controlled group.

| Periods | Study | | Control | | Wilcoxon Sum Rank test | |
|---------|--------|-------|---------|-------|------------------------|---------|
| | Median | MR | Median | MR | Z | P-value |
| P1 | 7.00 | 14.15 | 4.50 | 6.85 | 2.797 | 0.004** |
| P2 | 6.00 | 12.65 | 4.50 | 8.35 | 1.646 | 0.105 |
| P3 | 6.00 | 12.70 | 3.00 | 8.30 | 1.687 | 0.105 |
| P4 | 4.50 | 11.80 | 3.00 | 9.20 | 1.006 | 0.353 |
| P5 | 3.50 | 11.95 | 2.00 | 9.05 | 1.113 | 0.280 |
| P6 | 1.00 | 11.65 | 1.00 | 9.35 | 0.920 | 0.393 |
| P7 | 1.00 | 11.00 | 1.00 | 10.00 | 0.425 | 0.739 |

Table 7: showed pain reduction within each group with time.

| Periods | Study | | Control | |
|---------------------|------------|----------|----------|------|
| | Median | MR | Median | MR |
| P1 | 7.00 | 6.30 | 4.50 | 6.25 |
| P2 | 6.00 | 6.00 | 4.50 | 6.30 |
| P3 | 6.00 | 5.50 | 3.00 | 4.95 |
| P4 | 4.50 | 3.45 | 3.00 | 4.05 |
| P5 | 3.50 | 3.05 | 2.00 | 3.25 |
| P6 | 1.00 | 2.05 | 1.00 | 1.80 |
| P7 | 1.00 | 1.65 | 1.00 | 1.40 |
| Friedman Statistics | Chi-square | 53.181 | 54.748 | |
| | df | 6 | 6 | |
| | Sig | 0.000 HS | 0.000 HS | |

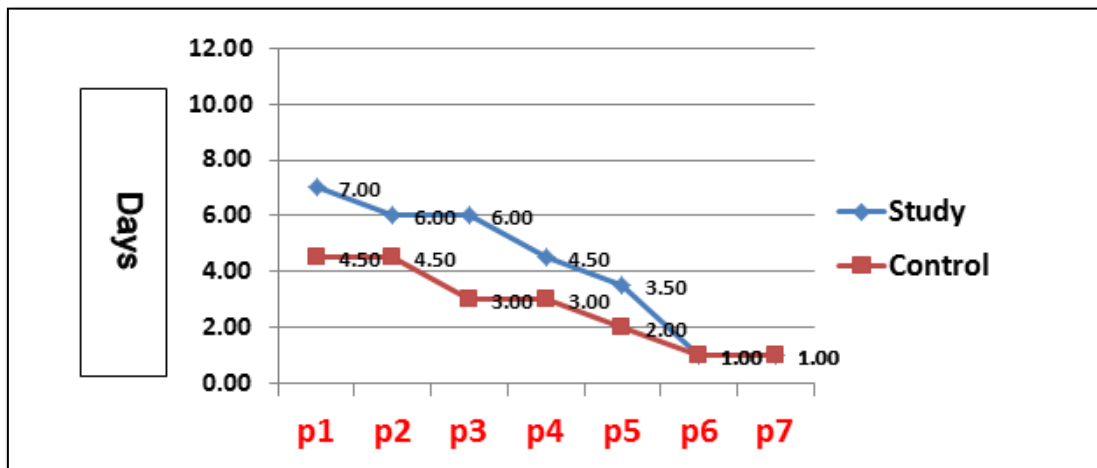


Fig 5: showed pain reduction in both groups with time.

Comparison of pain among days within each group showed that there is marked reduction in pain with time and the decrease being significant

in comparing day 1 and day 6, day 1 and day 7, day2 and day6, day 2 and day7, the remaining results are showed in table 8.

Table 8: showed comparison between pains at different days within each group.

| Groups | Period | Z | P-value | Periods | Z | P-value | Periods | Z | P-value |
|---------|--------|-------|---------|---------|-------|---------|---------|-------|---------|
| Study | 1 X 2 | 0.311 | 1 | 2 X 4 | 2.640 | 0.174 | 3 X 7 | 3.985 | 0.001** |
| | 1 X 3 | 0.828 | 1 | 2 X 5 | 3.054 | 0.047* | 4 X 5 | 0.411 | 1 |
| | 1 X 4 | 2.950 | 0.067 | 2 X 6 | 4.089 | 0.001** | 4 X 6 | 1.449 | 1 |
| | 1 X 5 | 3.364 | 0.016* | 2 X 7 | 4.503 | 0.000** | 4 X 7 | 1.863 | 1 |
| | 1 X 6 | 4.399 | 0.000** | 3 X 4 | 2.122 | 0.711 | 5 X 6 | 1.035 | 1 |
| | 1 X 7 | 4.813 | 0.000** | 3 X 5 | 2.536 | 0.235 | 5 X 7 | 1.449 | 1 |
| | 2X3 | 0.518 | 1 | 3 X 6 | 3.571 | 0.007** | 6 X 7 | 0.414 | 1 |
| Control | 1 X 2 | 0.052 | 1 | 2 X 4 | 2.329 | 0.417 | 3 X 7 | 3.675 | 0.003** |
| | 1 X 3 | 1.346 | 1 | 2 X 5 | 3.157 | 0.033* | 4 X 5 | 0.828 | 1 |
| | 1 X 4 | 2.277 | 0.478 | 2 X 6 | 4.658 | 0.000** | 4 X 6 | 2.329 | 0.417 |
| | 1 X 5 | 3.105 | 0.040* | 2 X 7 | 5.72 | 0.000** | 4 X 7 | 2.743 | 0.128 |
| | 1 X 6 | 4.606 | 0.000** | 3 X 4 | 0.932 | 1 | 5 X 6 | 1.501 | 1 |
| | 1 X 7 | 5.020 | 0.000** | 3 X 5 | 1.760 | 1 | 5 X 7 | 1.915 | 1 |
| | 2X3 | 1.397 | 1 | 3 X 6 | 3.261 | 0.023* | 6 X 7 | 0.414 | 1 |

DISCUSSION

Changing patient's behavior and opinion regarding surgical treatment is an important attitude that oral surgeon should have and should be accomplished with minimizing postoperative patients complain to maintain patient-doctor trust through reducing trauma, intact reflection of periosteum, delicate tissue grasping and handling, use of sharp drill with efficient cooling system to prepare implant bed and strict suturing technique to gain healing by primary intention⁽⁷⁾. Within the limitation of this study, there is no significant effect of age and gender on pain experience (P-value 0.650 and 0.350 respectively) which disagrees with the outcomes of Al-Khabbaz et al in 2007⁽³⁾ were females showed higher pain levels, however the role of gender in pain experience is still a matter of controversy^(8, 9). Pain scores were higher in the study group with 60% of cases showed sever pain score during the first day. Only one case within the controlled group showed sever pain score at day one post-surgery. Pain grades remain higher among study group throughout the seven days of follow up which might be related to bone compression phenomenon evoked with high insertion torque. Once torque exceeded that of capillary pressure, bone ischemia and necrosis would occur together with direct bone compaction and death of osteocytes⁽¹⁰⁾. This agrees with Irinakis & Weibe in 2009⁽¹¹⁾ who stated that bone necrosis would occur at torques above 50Ncm and agrees with Scarano et al in 2011⁽⁷⁾ who recorded that higher pain were documented with higher insertion torques.

The overall pain is reduced as the time elapsed in both groups which is significant when comparing day 1 and 6, day 1 and day 7 and could be

related to completion of necrosis which decreases stress of implant surface on bone as a part of normal healing process, there is no study confirms or agrees with such explanation.

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