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A CROSS-SECTIONAL RESEARCH TO COMPARE THE SAFETY AND EFFICACY OF DEBONDING PLIER AND CROWN REMOVER FOR BOND FAILURE SITE

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Abstract:

Background: *Orthodontic brackets debonding is considered as the last available option in the orthodontic treatment which needs ultimate care and use of best available strategy.*

Objective: *The aim of this research was to compare bond failure site after debonding brackets with the help of crown remover and debonding plier.*

Subjects and Methods: *This cross-sectional research was carried out at Allied Hospital, Faisalabad from September 2017 to April 2018. In this research, we bonded a total of 160 newly extracted premolars through metal brackets by dividing the total 160 cases among Group – A & B (each carrying 80 cases). Group – A was treated with the help of DP (Debonding Plier); whereas, Group – B was treated with CR (Crown Remover). A subsequent visual assessment of enamel surface was also carried out after debonding procedure for the possible adhesive remnant. We also applied an ARI (Adhesive Remnant Index) with a score of 0 – 3 (four-point scoring index). Moreover, cross-tabulation of both pliers was also carried out.*

Results: *Among 160 brackets, 80 were deboned by crown remover and remaining 80 through debonding plier. Debonding plier caused fifty percent incidence of failure of the bond at enamel adhesive interference; whereas, in case of crown remover presented failure of cohesive bond primarily in ARI category I & II. The researcher used SPSS for measurement of ARI Score. Both the pliers were cross-tabulated for safety and efficacy. There was a significant difference in the effectiveness of both the pliers. Detailed outcomes are given in the tabular and graphical data. Categorical data were compared through Chi-square test.*

Conclusion: *The bond failure site was most of the time in the range of adhesive when debonding was carried out with the help of CR; whereas, it was at enamel adhesive interference when treated with the help of DP. Outcomes show that CR is safer than DP in terms of safety and efficacy.*

Keywords: *Debonding, Plier, Crown, Remover, Bracket, Orthodontic, Adhesive and Enamel.*

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INTRODUCTION:

Orthodontic brackets debonding is considered as the last available option in the orthodontic treatment which needs ultimate care and use of best available strategy. Irreversible damage can be an outcome of a careless debonding strategy especially on the rich fluoride layer of enamel and increased the onset of caries [1, 2]. The importance of bond failure site is crucial during the process of debonding as the failure can occur at enamel adhesive interference, bracket adhesive interference or it can be the combination both [3]. In order to prevent enamel damage, we need to avoid enamel-adhesive interface bond damage [4 – 7].

Another important and crucial step is to evaluate bond failure site at the end; better evaluation helps the clinician in the selection of best available method for the removal of remnant adhesive from the surface of the enamel. ARI helps to access the type and site of bond failure [8]. ARI refers to an index of tooth surface assessment which is qualitative in nature and helps to assess the leftover remnant adhesive on the surface of enamel after debonding procedure [9].

Traditionally, different mechanical approaches are available for debonding of orthodontic metal brackets which utilizes various pliers to remove brackets. Debonding plier is commonly known mechanical device [11]. It is placed at the base of the bracket to avoid any distortion in the bracket; whereas, we can also remove metal brackets through crown removers which is also a practice in the field of prosthodontics [12]. The null hypothesis says that type of plier causes no difference; whereas, the difference occurs at the interfaces of bracket adhesive. The aim of this research was to compare bond failure site after debonding brackets with the help of crown remover and debonding plier.

METHODOLOGY:

This cross-sectional research was carried out at Allied Hospital, Faisalabad from September 2017 to April 2018. In this research, we bonded a total of 160 newly extracted premolars through metal brackets by dividing the total 160 cases among Group – A & B (each carrying 80 cases). Group – A was treated with the help of DP (Debonding Plier; whereas, Group – B was treated with CR (Crown Remover). A subsequent visual assessment of enamel surface was also carried out after debonding procedure for the possible adhesive remnant. We also applied an ARI (Adhesive Remnant Index) with a score of 0 – 3 (four-point scoring index). Moreover, cross-tabulation of both pliers was also carried out. We stored these premolars in thymol aqueous solution (0.1 % wt/ volume). A soft plaster jig was prepared in order to mount premolar. A new stainless-steel bracket was bonded with the buccal surface. The bracket was removed after twenty-four hours. Debonding was carried out through the base method as shown in Figure I, II, III & IV.

Figure – I: Bracket Debonding Plier

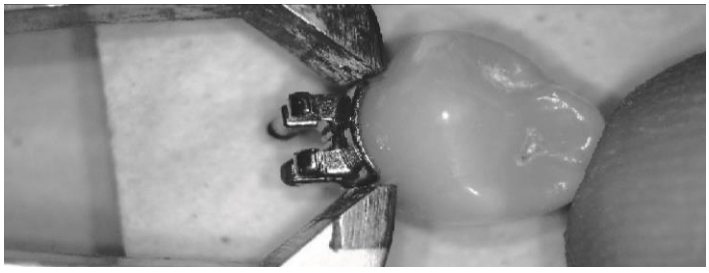


Figure – II: Base Debonding Method by Using Debonding Plier

Figure – III: Automatic Spring Crown Remover

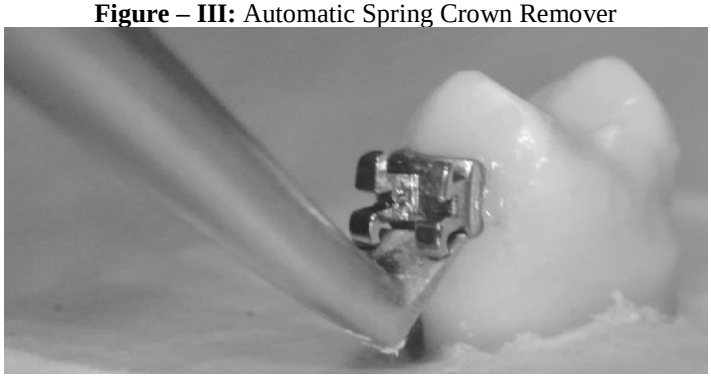


Figure – IV: Placement of Automatic Spring Crown Remover at Base during Debonding Method

RESULTS:

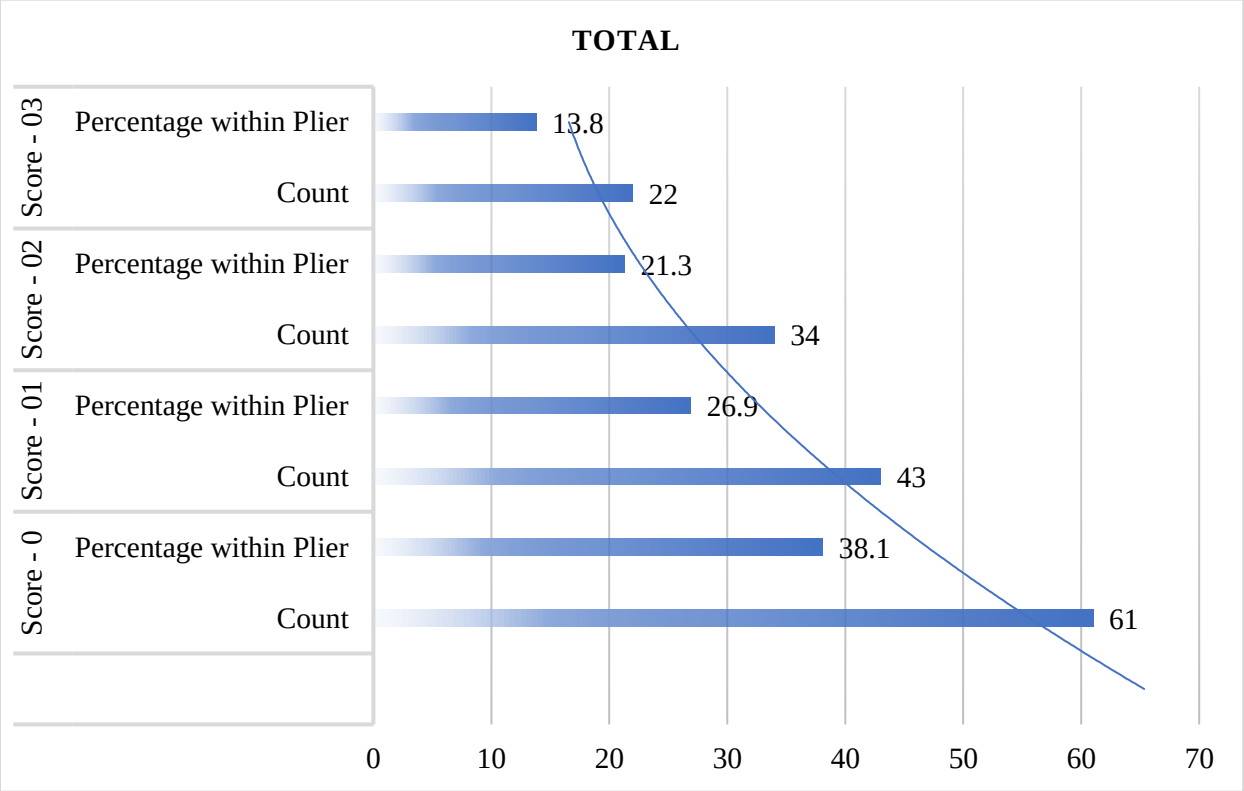
Among 160 brackets, 80 were deboned by crown remover and remaining 80 through debonding plier. The researcher used SPSS for measurement of ARI Score. Both the pliers were cross-tabulated for safety and efficacy. Debonding plier caused fifty percent incidence of failure of the bond at enamel adhesive interference; whereas, in case of crown remover presented failure of cohesive bond primarily in ARI category I & II. Categorical data were compared through Chi-square test. There was a significant difference in the effectiveness of both the pliers. Detailed outcomes are given in the tabular and graphical data.

Table – I: Adhesive Remnant Index

Score	Percentage	Adhesive left on the tooth
0	0	No Adhesive
1	< 50	Less than Half
2	> 50	More than Half
3	100	All Adhesive Left

Table – II: Cross-Tabulation

Efficacy Score		Plier		Total
		CR	DB	
Score - 0	Count	18	43	61
	Percentage within Plier	22.5	53.8	38.1
Score - 01	Count	26	17	43
	Percentage within Plier	32.5	21.3	26.9
Score - 02	Count	26	8	34
	Percentage within Plier	32.5	10	21.3
Score - 03	Count	10	12	22
	Percentage within Plier	12.5	15	13.8



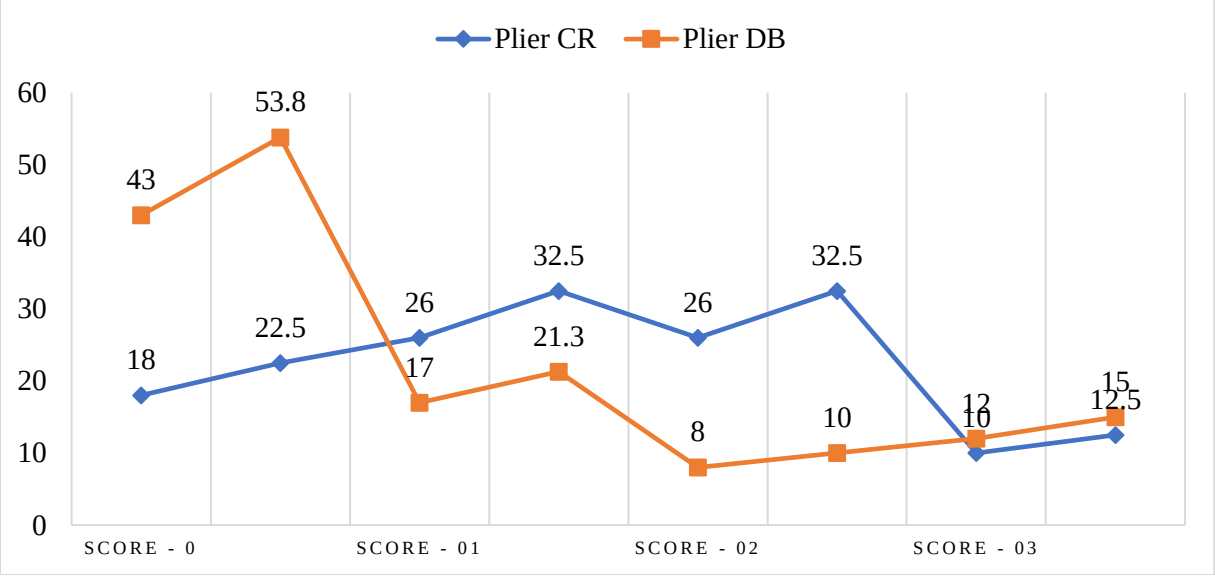


Table – III: Chi-Square Test

Values		**df**	**Asymp. Sig 2-tailed**
Pearson Chi-Square	21.841a	3	0
N of Valid Cases	160		

DISCUSSION:

ARI scoring provides a quick and easy way to take a valuable decision about bon failure site. It shows the enamel loss in the debonding procedure in relation to Ca remnants and ARI [13, 14]. Except debonding approach the bond failure site is also influenced by adhesive type, oral environment, mesh design of the bracket, bonding technique and filler contents during debonding method [10, 15 – 21]. Therefore, the debonding technique is not the only indicator of bond failure site.

We preferred base debonding method as debonding plier blades and line of action of force coincides with a layer of the adhesive which results in smooth bracket separation in the debonding procedure [13]. Debonding plier caused fifty percent incidence of failure of the bond at enamel adhesive interference; whereas, in case of crown remover presented failure of cohesive bond primarily in ARI category I & II. Therefore, debonding plier is not that much safe as crown remover is safe for enamel integrity. Brosh also presented similar outcomes in which the debonding approach showed 68.7% site of bond failure close to the surface of enamel and 54.47% accumulation of Ca remnants on the base of the bracket.

Spring type crown remover is safer than debonding plier as this particular research utilized mixed bond failure within the adhesive for enamel integrity. The occurrence of bond failure due to spring type crown remover was 12.5% at the interface of the adhesive bracket. Knösel also studied crown remover in his series and reported that site of bond failure site was either at the interface of bracket adhesive or within the adhesive [12]. There was no bond failure occurrence at the interface of enamel adhesive; it is not the same as we reported the same as 22.55 in this research. The possible reason behind this may be the difference in the type of crown remover type used in the study. Our research and Knösel research respectively used sudden shear type force delivered by spring of the crown remover; whereas, the other used air pressure to force the bracket [12].

David prefers quantitative ARI research over qualitative ARI studies because crown remover is a new tool which has been studied qualitatively for debonding of brackets [22, 23].

CONCLUSION:

The bond failure site was most of the time in the range of adhesive when debonding was carried out with the help of CR; whereas, it was at enamel adhesive interference when treated with the help of DP. Outcomes show that CR is safer than DP in terms of safety and efficacy. Further research studies will also help to integrate crown remover as a tool for debonding procedure.

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