

D-section Tissue cutter - a new grossing tool: An observational study

Dinesh Y ¹, Gheena S ², Pratibha Ramani ³, Karthikeyan Ramalingam ^{4*}

¹Postgraduate student, Department of Oral and Maxillofacial Pathology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai, India, E-mail: drdineshdentist@gmail.com

²Professor, Department of Oral and Maxillofacial Pathology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai, India, E-mail: gheena@saveetha.com

³Professor & Head, Department of Oral and Maxillofacial Pathology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai, India, E-mail: pratibaramani@saveetha.com

⁴Professor and Head, Department of Oral and Maxillofacial Pathology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai, India, E-mail: karthikeyanr.sdc@saveetha.com

Abstract

Background: Grossing is the process of selecting, cutting, and orienting individually labelled specimens, recording the number and macroscopic description of tissues kept for processing.

Aim: The aim of the study is to compare the efficiency of our invention, D-section Tissue cutter and scalpel with Bard Parker blade No: 11.

Materials And Methods: 20 formalin fixed tissues from 5 different sites were retrieved from the tissue storage of the Department of Oral and Maxillofacial Pathology. Tissues retrieved were oral mucosa, tongue, skin, lymph node and decalcified bone. The size of the tissue was from 1 to 3 cm. The tissues were cut using the D Section Tissue cutter and Scalpel. Two investigators analysed the efficiency of the instrument on each tissue type on the quality parameters including borders, cutting efficiency, depth of sectioning, difficulty in stability of specimen and time taken for cutting.

Results: Good Stabilisation of the specimen and clean cut borders were found in lymph node samples using a D section tissue cutter. Precise cutting edge of tissues was found in adipose tissue when compared to BP blades. No significant difference was found on comparing D section tissue cutter and BP blades.

Conclusion: D-section tissue cutter showed superior results when compared to BP blade. This instrument is safe to use, easy to transport, precision and accurately cuts the tissue.

Keywords: Surgical pathology, Grossing, Tissue section, D-section tissue cutter, BP blade No: 11

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INTRODUCTION

Grossing of surgical specimens is the process of transferring, selecting, cutting, and orienting individually recognised specimens, placing them in identified cassettes, noting the number and macroscopic description of tissues kept for processing (1).

Grossing is done before histopathological examination and sampling of tissue for diagnostic and research purposes. It can be performed for all types of tissues including hard & soft tissues. The methodology and instruments utilised vary based on the type of specimen that needs to be grossed. In head and neck region, most commonly encountered specimens are oral mucosa, lymph node, skin, bone, salivary gland etc.,

Soft tissue should be held in firm position for precise cutting of tissue during grossing. When a soft tissue of size more than 1 cm is grossed it is held firmly by fingers or tissue forceps and cut using a BP blade. The necessity of grossing a specimen is to aid in proper orientation and to examine the cut surface of the tissue specimen (2).

Mishandling of tissue while grossing will lead to artefacts which may have a great impact in histopathological diagnosis. Fragile tissues could tear during grossing or show jagged borders. Holding the tissue with gloves can cause powder artefact and firm pressure with tissue forceps may cause squeeze artefact. Grossing a specimen is an important step in managing a tissue for

surgical pathology (3).

Typically, grossing of soft tissue specimens requires a cutting blade to cut tissues for proper orientation and sampling. It is usually done with a BP blade and a support mechanism to hold tissue in position for proper cutting of tissue (4). Grossing can be done by various holding mechanisms like tissue forceps or tweezers or by holding with fingers (5).

Our invention – The D section tissue cutter overcomes the disadvantages caused by aforementioned methods. It is a cutting tool used to cut the tissue into multiple parts. The present invention could be used in the field of pathology, especially in grossing of soft tissue specimens.

The present invention is used in the field of pathology, especially in grossing of soft tissue specimens. While grossing, small specimens are difficult to hold and section, since they are very small and slippery. Poor handling may lead to improper sectioning leading to ragged cutting of specimen or accidental injury to their finger; hence a new tool which makes section hands free from direct handling of specimen and blade will make the work easier.

Accurate and precise cuts are needed during embedding, keeping the flat surface down and improving the tissue section for tissue blocks. Newer advances in grossing kits are essential to improve the quality of surgical pathology (6)(7).

The rationale of this study is to improve the quality of grossing and thereby improving the quality of histopathological sections. The null hypothesis stated is that BP blade is an efficient tool in grossing when compared to a D-Section tissue cutter. The aim of the study is to compare the efficiency of D-section tissue cutter and BP blade in cutting the tissues.

Materials And Methods

D-section tissue cutter

The Patent Number of the D-section tissue cutter in IPR- 20224100889. This invention, in particular, relates to grossing of soft tissue specimens. This invention also relates to precision slicing of a single soft tissue into two parts using a disposable blade and mechanical closure of the counterpart will section the tissue into two parts (Fig 1).

D-Section tissue cutter consists of 2 parts (Fig 2), A tissue support system: Two tissue holders, a tissue seat, a slit, two clamps and two scales are made of stainless steel extended as a hinge to connect with the counterpart.

The tissue holders have 3 parts - a cylindrical rod 3mm diameter, 5.5cm in width, outer controller handle (F) to control the inner tissue holder part, the inner tissue holder part has a concavo-convex surface, concave facing tissue and convex away from tissue (G). A tissue seat is a semi-circular depression of 2.5 cm in diameter for the placement of tissue in a firm, rigid base to rest the tissue; most of the tissues are spherical, ovoid or round. The lower semi-circular base will be utilized to rest the specimen (H). A slit 0.6mm width and 2 cm depth will guide the blade to pass in the slit like portion to cut the specimen; the upper margin of the slit is diverged for smooth guidance of blade into the slit (I). Two metric graduated scales horizontal and vertical on both sides (left and right) are provided to measure the specimen (E).

Counterpart includes a disposable blade, blade holding pins, a blade seat, and a hinge. A blade seat is used to place the disposable blade (A) and it is held in position without displacement by blade holding pins (B). A disposable blade made of stainless steel of 0.5mm thickness, 5cm width, 2.25mm height has two holes of diameter 3mm for blade holding pins to pass through, it has double wedge margin (C). A hinge is used for mechanical closure and opening of the device (D).

Specimen collection

20 Formalin fixed tissues from 5 different sites were retrieved from the archives of the Department of Oral and Maxillofacial Pathology, Saveetha Dental College and Hospitals, Chennai. Tissues retrieved were oral mucosa, tongue, skin, lymph node and decalcified bone. The size of the tissue samples were from 1 to 3 cm.

The tissues were grossed with conventional scalpel with BP blade No:11 and our invention – D Section Tissue Cutter. Two investigators analysed the efficiency of the instrument on each tissue type based on the quality parameters including borders, cutting efficiency, depth of sectioning, difficulty in stability of specimen and time taken for cutting. Working of D-section tissue cutter is done by placing the specimen in the tissue rest and the specimen is held firmly by the clamps (Fig 3). The counterpart is closed to cut the specimen into two halves.

The scoring was given from 1 to 3 where 1- good, 2- fair, 3- poor for both procedures. The data was transferred to Excel sheet. Statistical analysis with Chi-square test was done using SPSS software (v 25.0)

Results

Our results showed on comparing the instruments on buccal mucosa, the p-value for stabilisation of specimen, precise cutting of tissues, cut borders were 0.45, 0.73, 0.64 respectively ($p < 0.05$) (Fig 4). For tongue specimens, the p-value for stabilisation of specimens, precise cutting of tissues, cut borders were 0.67, 0.82, 0.9 respectively ($p < 0.05$) (Fig 5). For lymph Node specimens p-value for stabilisation of specimens, precise cutting of tissues, cut borders were 0.38, 0.90, 0.73 respectively ($p < 0.05$) (Fig 6). For Salivary gland specimens, p-value for stabilisation of specimens, precise cutting of tissues, cut borders were 0.64, 0.73, 0.73 respectively ($p < 0.05$) (Fig 7). For Decalcified bone samples, p-value for stabilisation of specimens, precise cutting of tissues, cut borders were 0.93, 0.64, 0.9 respectively. In Adipose tissue, p-value for stabilisation of specimens, precise cutting of tissues, cut borders were 0.95, 0.73, 0.76 respectively ($p < 0.05$) (Fig 8).

Discussion

A crucial step in preparing a tissue for histological analysis is grossing the specimen.

Grossing tissue incorrectly might result in artefacts that can greatly affect the histopathological diagnosis.

Our invention – D Section Tissue Cutter is, however concerned with grossing the tissue and supporting the tissue, as well as with aids for two dimensional measurement. This present invention includes two graduated metric scales to measure height and width on both sides (left and right) to measure the two cut portions of the specimen. Syed et al in a review of artefacts in histopathology discussed about artefacts associated with usage of scalpels, such as blunt knife, bevel of knife too wide, non-uniform thick and thin sectioning of specimen etc., (8).

Our D- section Tissue cutter is a tissue support system which includes the tissue holders to hold the tissue in position for precision cutting of the tissue. It has a counterpart with a disposable blade which is stable and precisely cuts the tissue and improves accuracy of cutting when compared to BP blade. It prevents tissue damage like jagged cut surfaces, other artefacts like squeeze artefacts, glove powder artefacts etc. It provides a rigid base and prevents movement of tissue while cutting, increasing stability and rigidity of tissues. It is easy to sterilise, since the device is made of Stainless steel and could be autoclaved. Graduated scale in the lower border can be used to measure the specimen. It also used disposable blades which are easy to place and remove from the device. The D-section tissue cutter is compact and is small in size making it easy to transport.

The limitations of our study include small sample size, inclusion of only specimens of head and neck origin, study of only grossing parameters.

We are planning to study its impact on histopathological sections. We are also planning to study tissue samples of various organs, fresh unfixed tissue and comparative study on histopathological parameters with conventional grossing tools.

Conclusion

Our invention, D-section tissue cutter showed superior results when compared to BP blade. This instrument is safe to use, easy to transport, precision and accurately cuts the tissue. It is essential to include this instrument to the grossing kit to enhance the quality of histopathological sections.

Declarations

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Conflict of Interest: All the authors declare no conflict of interest.

Authors Contributions: DY, GS and PR designed and carried out the study; DY & KR wrote the manuscript, it was revised and guided by PR, KR and GS.

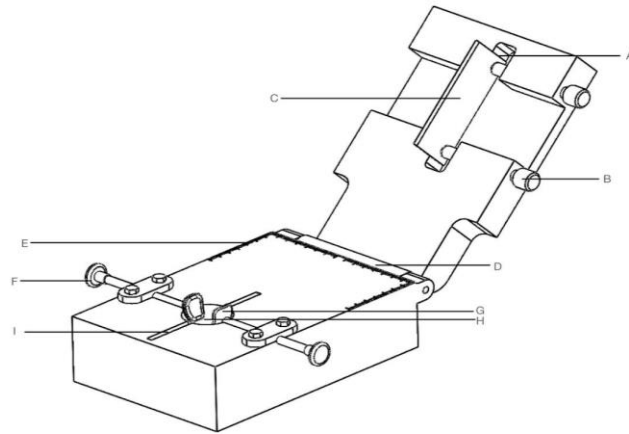


Fig 1: represents D-section tissue cutter showing tissue support system and a counterpart

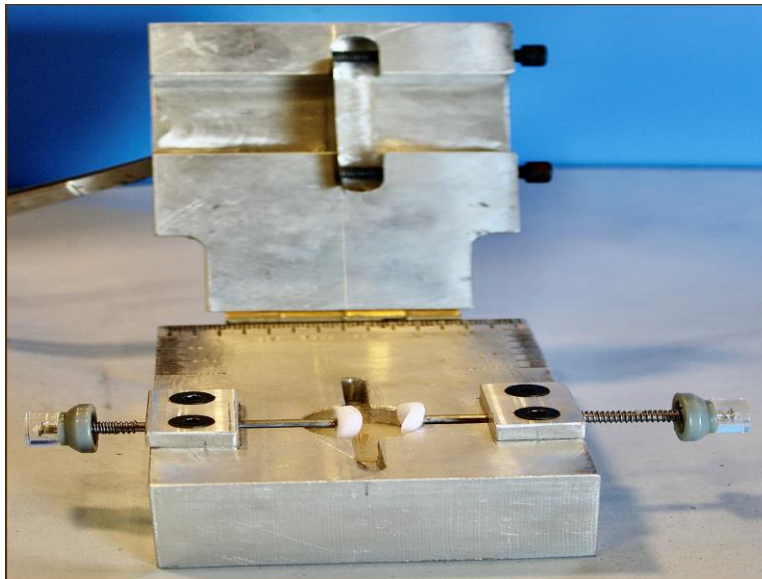


Fig 2: Image of D-section tissue cutter

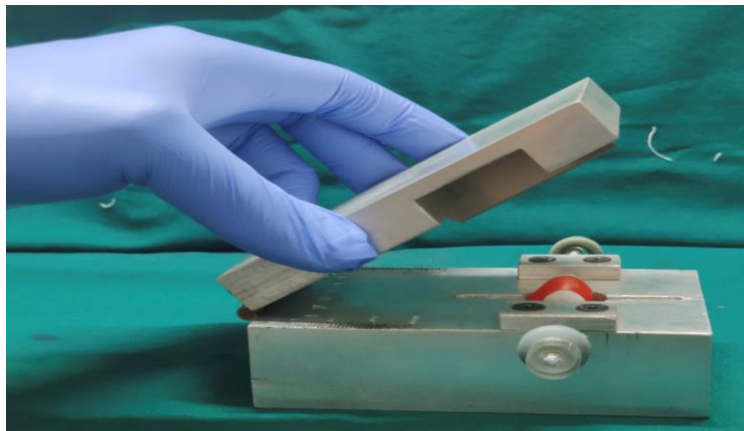


Fig 3: Image represents D-section tissue cutter sectioning specimen.

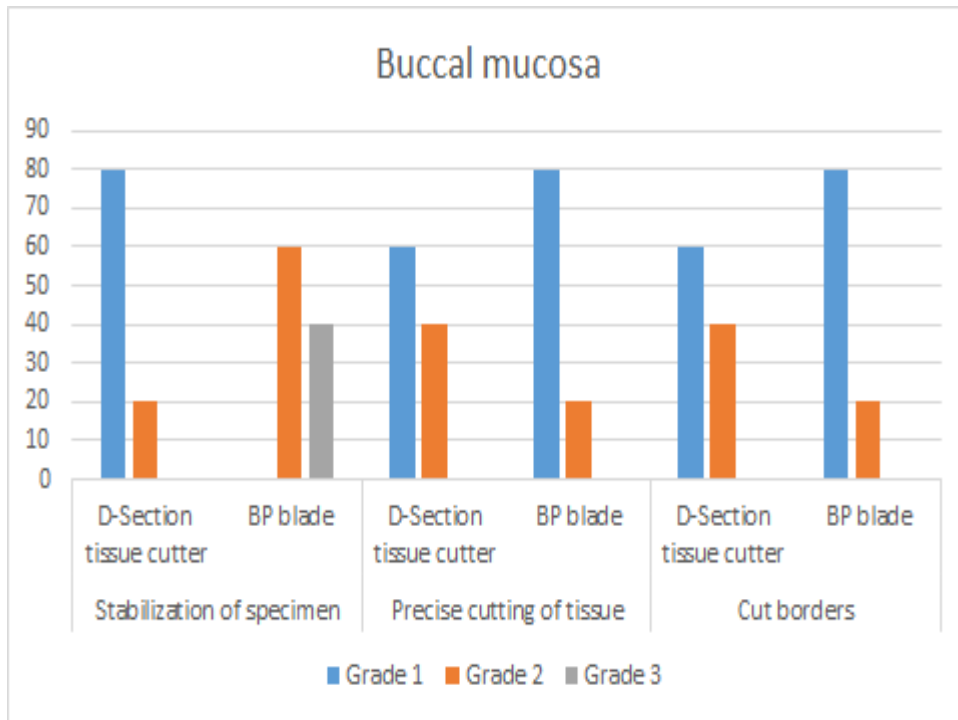


Fig 4: Bar chart represents the scores of the parameters in buccal mucosa tissues using D-section tissue cutter and BP blade. (score 1-good, 2- fair, 3- poor). The chi- square test results on comparing the instruments in buccal mucosa p-value for stabilization of specimen , precise cutting of tissues, cut borders were 0.45, 0.73, 0.64 respectively($p < 0.05$).

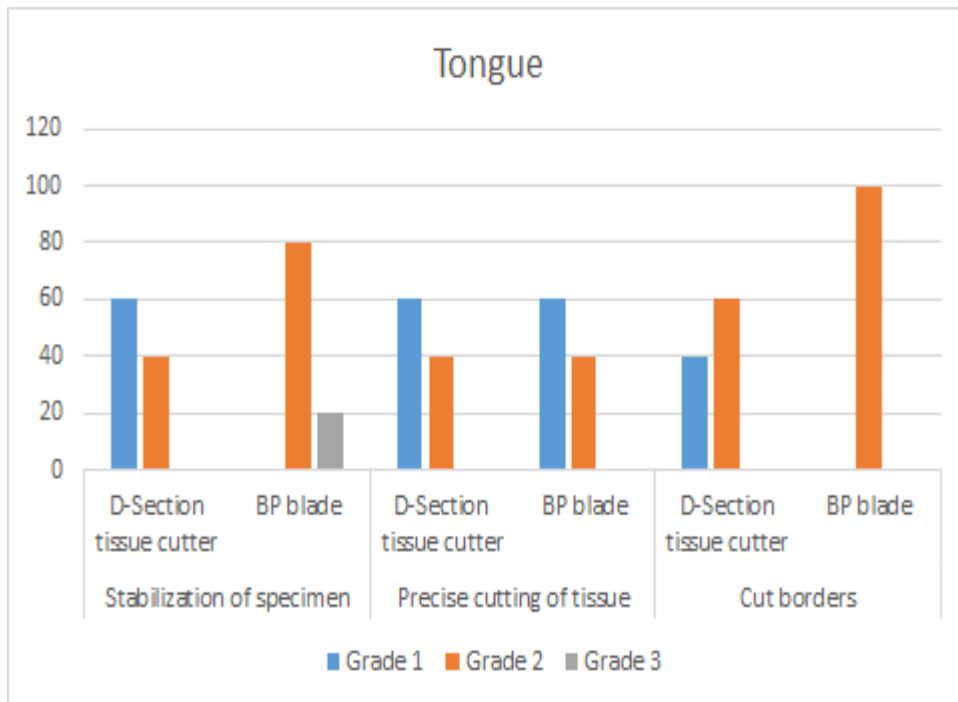


Fig 5: Bar chart represents the scores of the parameters in tongue tissues using D-section tissue cutter and BP blade.(score 1- good, 2- fair, 3- poor). In Tongue, chi square test on p-value for stabilization of specimens , precise cutting of tissues, cut borders were 0.67, 0.82, 0.9 respectively ($p < 0.05$).

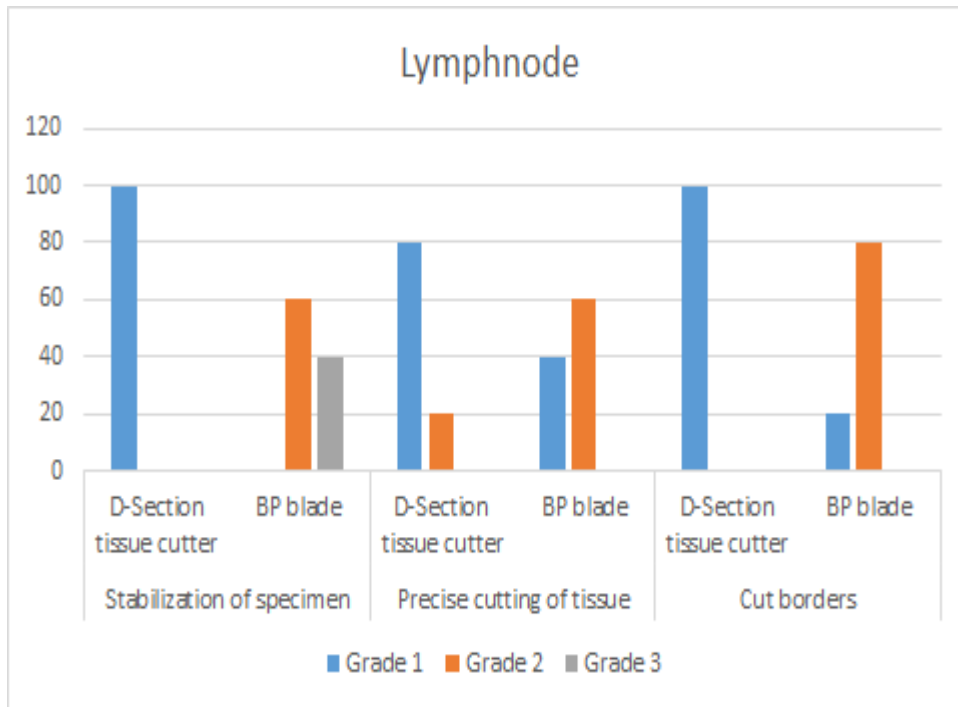


Fig 6: Bar chart represents the scores of the parameters in lymph node tissues using D-section tissue cutter and BP blade.(score 1-good, 2- fair, 3- poor). In Lymph Node specimens chi square test revealed p-value for stabilization of specimens , precise cutting of tissues, cut borders were 0.38, 0.90, 0.73 respectively ($p < 0.05$).

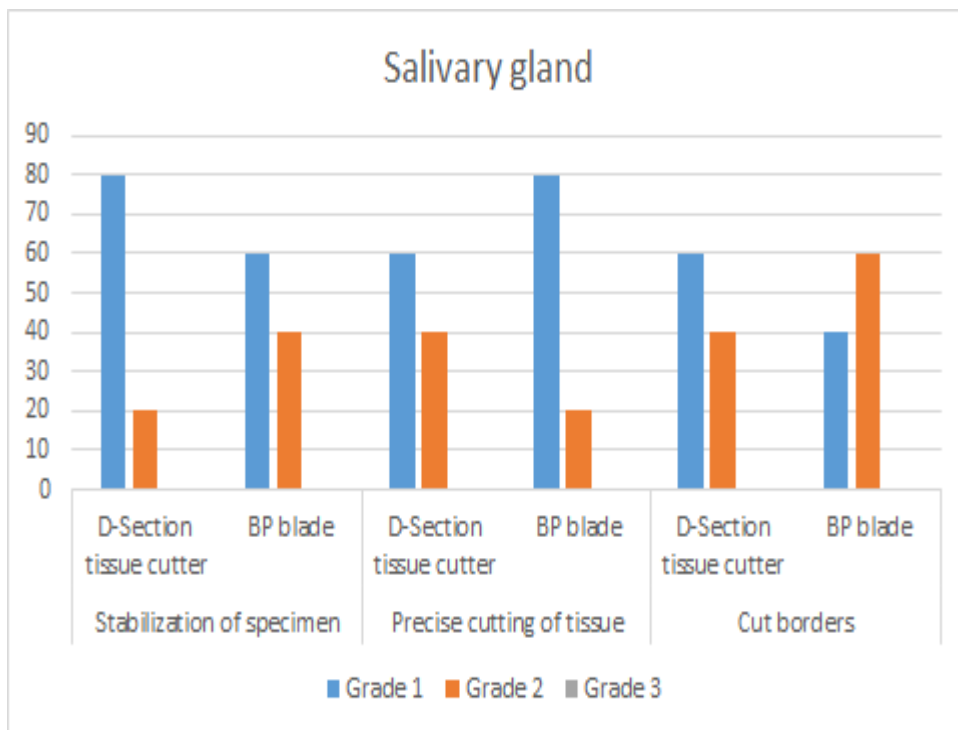


Fig 7: Bar chart represents the scores of the parameters in salivary gland tissues using D-section tissue cutter and BP blade. (score 1-good, 2- fair, 3- poor). In Salivary gland specimens chi square results revealed p-value for stabilization of specimens , precise cutting of tissues, cut borders were 0.64, 0.73, 0.73 respectively ($p < 0.05$).

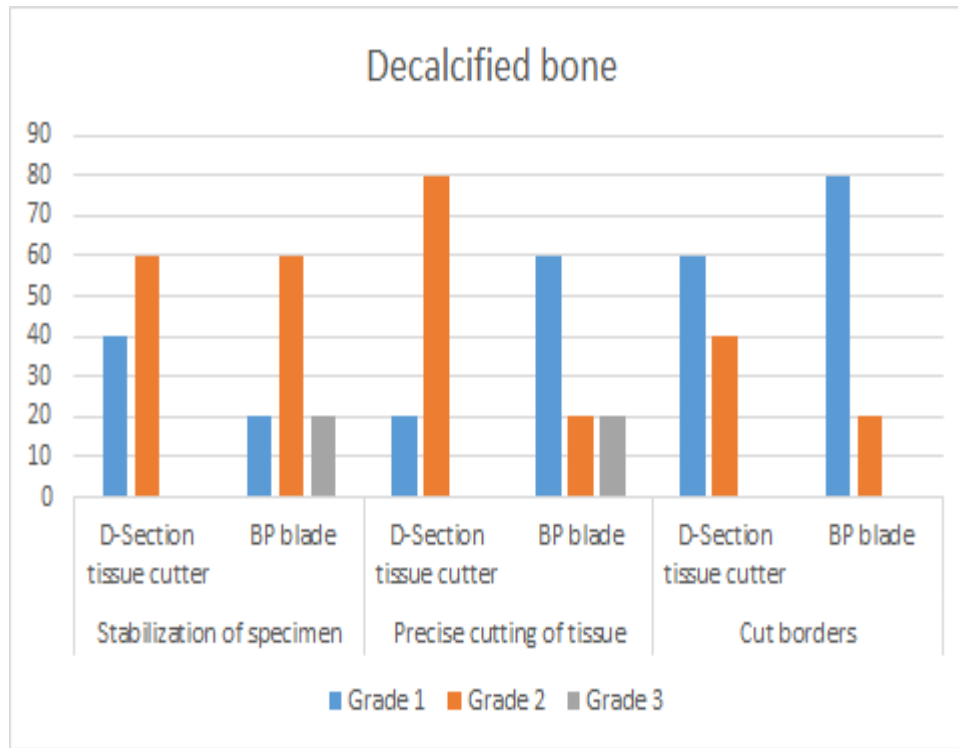


Fig 8: Bar chart represents the scores of the parameters in decalcified bone tissues using D-section tissue cutter and BP blade.(score 1-good, 2- fair, 3- poor). In Decalcified bone, the chi-square test results revealed p-value for stabilization of specimens , precise cutting of tissues, cut borders were 0.93, 0.64, 0.9 respectively ($p < 0.05$).

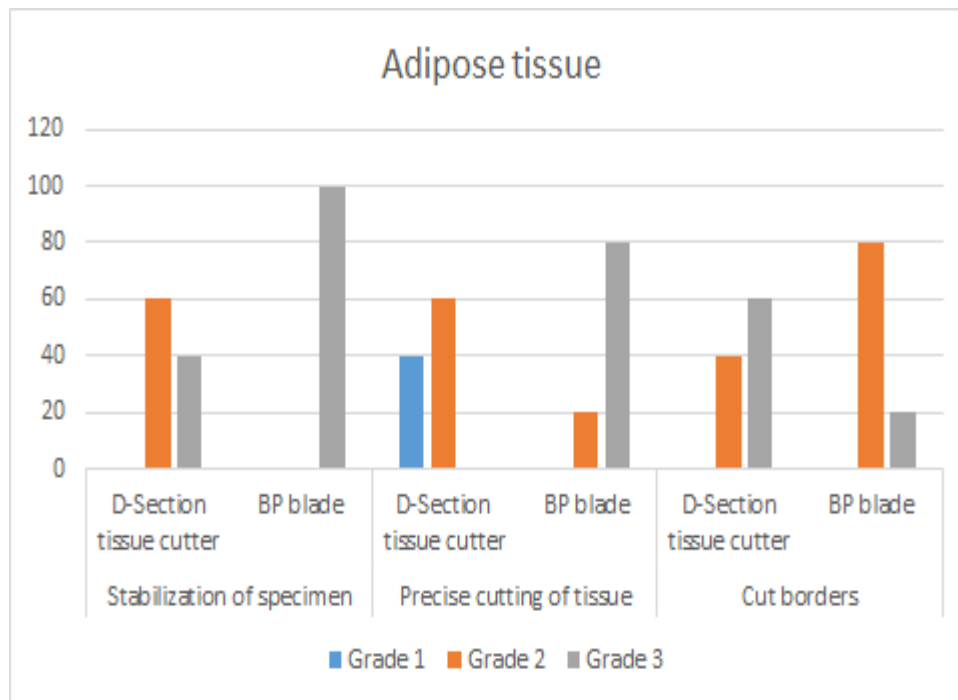


Fig 9: Bar chart represents the scores of the parameters in adipose tissues using D-section tissue cutter and BP blade. (score 1-good, 2- fair, 3- poor). In Adipose tissue, the chi-square results revealed p-value for stabilization of specimens , precise cutting of tissues, cut borders were 0.95, 0.73, 0.76 respectively ($p < 0.05$).

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