ORIGINAL RESEARCH

Bone expansion as a preservation process over the premaxillary type D3 bone: An original research

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ABSTRACT
Introduction: Ridge splitting with bone expansion is a technique of manipulation of bone to form receptor site for implantwithout removing any bone from the implant site. Maxillary bone has inherent quality of flexibility which can be molded todesire location by using series of instrument namely chisels and osteotome. This further improves quality of bone all aroundimplant, at the crest and apex both. This study describes a clinical case with management of bucco-palatal ridge defect withmodified ridge splitting and expansion osteotomy technique using chisel and osteotomes in an esthetic zone. **Materials andmethod:** This study includes thirty patients, 10 women and 20 men, who underwent implant placement following split ridgebone augmentation. All qualified subjects presented with a buccolingual width dimension of 3–5 mm and a minimum boneheight dimension of 10 mm prior to surgery. Implants were placed simultaneously or 3 weeks following the initial surgery.Thirty implants were placed in maxilla. All surgical procedures were performed by the same surgeon within a 2-year period.**Results:** In this study, the osseointegration success rate of implants placed in areas which were augmented with the use ofsplit ridge technique was estimated to be 97%. **Conclusion**: The ridge splitting technique of bone expansion is effective inlongitudinalexpansionofthealveolarridgeincasesofalveolaratrophyandknifeshapedridges.
Keywords:Splitridge,buccolingualdefect,augmentation

INTRODUCTION

The availability of adequate bone volume for dentalimplantplacementinestheticzoneisoftendiminished by tooth loss associated with trauma inmany young healthy individual. Loss of bucco-palataldimensionofridgefurthernecessitatescallsforadditionalproceduretoreceiveoptimumimplantborneprosthesis.Managementofsuchdefectbecomesstillcriticalinestheticzone.Lateralaugmentation with autogenous bone and guided boneregeneration(GBR)andbone-expansion(bone-splitting)techniqueshavebeenadoptedformanagement of bucco-palatal horizontal ridge defectsuccessfully.It is well-established that the implantplacementmustbeprostheticallydrivenandnotbone.Ifone fails toachievenecessary modificationin bony defect prior implant placement then estheticandmay befunctionalfailureisinevitable.Ridgeaugmentation using autograft and block graft, GBRusingmembranehaveprovedtobesuccessfulinhighly resorbed ridges to achieve result in horizontalandverticaldimensionbutseveraldrawbacksincludinginvasiveness,additionaldonorsite,resorption of grafting materials, memberane collapseandexposure to infection and delaying of implantinstallationforgraftingmaturation.Hence,employingsuchtraumatictechniqueinmoderatehorizontalridge defect(≥3mm)isnotnecessary.Morenoninvasivetechniqueofridgesplittingandexpansioncanbecarriedouteasily, withoutmuchtrauma to the patient.When the bucco-lingual bonewidth is 3 mm or greater but <6 mm, to allow implantplacement, augmentation of the alveolar ridge using aridgesplittingandboneexpansiontechniqueisaviable option. The 3 mm of bone should have at least1mmof trabecularbone

sandwichedbetweenthecorticalplates.Thatwillensure1.5mmofbone(cortical and cancellous) on either side of the splitridge and allow the bone to spread and maintain agoodbloodsupply.Severalridgesplittechniqueshavebeendevelopedinpastfewdecadesandincludessplitcrestostеotomy,Ridgeexpansionosteotomy,andnumerousmodifications.Summers(1994) advocated use of osteotome in progressivelyincreasingdiametertocreateosteotomybedforimplant placement during same stage. Maxillary boneissofterinquality (mainly D2,D3 and D4 type).Failure rates of implant placed by mere drilling arevery high in maxilla. The use of osteotome allowsmanipulation and compactionthe peri-implant boneto achieve excellent primary stability without losinganybone.However,someauthorsclaimscertainbone loss associated with use of osteotome to achieveboneexpansion.Thepossiblereasonbeingstressconcentrationatthecrestwhileprogressingtheosteotomy to wider diameter.This study describes thebone expansion done as a preservation process overthepremaxillarytypeD3bonebyusingthetechniqueofmodificationofridgesplitboneexpansionosteotomydoneusingosteotomesand chiselsinnarrowridge.Thealternateuseofosteotomes and chisels relieve the stresses at the crestby extending a chisel cuts slight mesial and distal toosteotomy.Unlikesegmentalridgesplitting,noattempts are made to give vertical osteotomies cutsand explains a technique of modified ridge split boneexpansionosteotomywithsimultaneousimplantplacementinmaxillaryestheticzone.

MATERIALS ANDMETHODS

Thirtypatients,10womenand20men,whounderwentimplantplacementfollowingsplit ridgebone augmentation were included in this clinical trial.All qualified subjects presented with a buccolingualwidth dimension of 3–5 mm and a minimum boneheight dimension of 10 mm prior to surgery. A splitridgeboneaugmentationtechniquewasusedtoreposition thebuccalcortexafterperformingagreenstickfracture ofthebuccalbonywall.

Table1:OsseointegrationinSinglestagesurgery

Treatment	Patients	Implants received	Osseointegration
Singlestagesurgery	25	25	97%
Twostage surgery	5	5	-

Implantswereplacedsimultaneouslyor3weeksfollowing the initialsurgery.Thirty implants wereplacedinmaxilla.Allsurgicalprocedureswereperformedbythesamesurgeonwithina2-yearperiod. The choice of single-stage or two stage splitridge bone augmentationwas determined primarilyby the bone density of the defective area, the size ofbuccolingualbonydimension,andtheabilitytoachieveprimarystabilityafterimplantplacement(torque of greater than 35 N). All maxillary defectiveareas with a buccolingual width of 3 mm were treatedwithtwo-stagesplitridgeboneaugmentationtechnique.Implantswithprimarystabilitylessthan35Nwereremovedandreplacedintheareaofaugmentation in a second stage surgery 3 weeks later.Twenty-five patients were treated withsingle-stagesplitridgeboneaugmentationandreceived25implants. The remaining 5 patients were treated withtwo-stage split ridge bone augmentation and received5implants.

RESULTS

Fifteenpatientswerereconstructedwithfinalprosthesis.Implantsplacedin25patientsshowedosseointegration success after insertion as determinedby Buser's Criteria. In this study, the osseointegrationsuccess rate of implants placed in areas which wereaugmented with the use of split ridge technique wasestimatedtobe97%.Nodifferencesofosseointegrationwereappreciatedbetweenthesingle-stageandtwo-stagesplitridgeboneaugmentation techniques. Five patient presented withfacial bone resorption and implant mobility 6 monthsaftersplitridgeaugmentation.Thisimplantwasremoved and the area was grafted with autogenousonlaybonegraftharvestedfromthemandibularramus. A second endosseous implant was inserted 4monthsafterthebonegraftingprocedure.

Table2:Groupsaccordingtothetreatment followed

	Patients	
GROUPA	15	p<0.05
GROUPB	15	
TOTAL	30	

DISCUSSION

Theridgesplittingtechniqueincludeslateralrepositioning ofthebuccalcortexbygreenstickfractureand,insomecases,simultaneousgraftplacement in the space created by the buccal-lingualcorticalplateseparation.Followingridgesplittingprocedures, perfusion of the buccal segment remainsintact; however, it shifts from an internal supply fromthe spongy bone to an external perfusion from theperiosteum. Blood supply from the periosteum allowsfor osseous tissue to develop, which eventually leadsto the formation of lamellar bone. Even though somestudieshaveplacedgraftmaterialbetweentheseparat

edplates,moststudieshaveshownthisplacementtobeunnecessary.Thesplitridgetechniqueisanadvantageousboneaugmentationtechniquebecauseitprovidesashortertreatmentperiodincomparisontoconventionalbonegrafttechniquessinceitdoesnotrequireawaitingperiodof 4–6 months for bone consolidation prior to implantplacement.Inaddition,itdecreasesthemorbiditysince it avoids a second surgical donor site for boneharvesting.However,thisprocedurecanonlyincrease the buccolingual bony dimension and is notapplicableifthereisinsufficientboneheightforimplant placement.Furthermore,implementingthetechnique on atrophic ridges less than 3.0 mm widemay result in unfavorable bone fractures that lead tobone resorption. Incases of significant bony ridgedefects and unfavourable ridge relationships, patientsmay benefit from an onlay bone graft augmentationtechnique. Previous studies have also shown successwiththesingle-stageridgesplittingtechnique.Simion et alreported on 5 maxillary and mandibularcaseswiththeuseofnonresorbablemembrane withoutbonegraftingandimmediateimplantplacement.Theauthorsreportedthatinallcases there was an increase in the buccolingual width with only minor loss of bone height.

In our study, a significant difference was observed inimplementingthetechniqueinthemaxilla.Mandibular ridge splitting may be more difficult toperform than maxillary because the mandibular bonepresentswithathickercorticalplateandlessflexibility,thereby making the buccalcortexmoresusceptibletounfavorablefractureduringbonyexpansion. While many studies have shown positiveoutcomes with the single-stage split ridge technique,Elian et al and Enislidis et al reported that the two-stage approachispreferabletosimultaneousridgeexpansionwithimplantplacement.Theauthorsreport that although it increases the necessary timeuntilcasecompletion,thetwo-stageapproachreducesoperativeandpostoperativecomplicationsandprovidesagenerally morestableoutcome.Incomparison,ourstudyimplementedthetwo-stageprocedure in cases where bone expansion of 3 mm ormore was necessary in order to ensure no unfavorablefracture of the bone.In analyzing osseointegration,we found no difference between immediate and lateimplantplacement.

CONCLUSION

Our study analyzed the osseointegration success rateof implants placed in areas that had been augmentedwithsplitridgeboneaugmentationtechniques. Itdemonstratedthattheridgesplittingtechniqueiseffectivein longitudinalexpansionofthealveolarridge in cases of alveolar atrophy and knifeshapedridges.Theimplantsuccessratewasfoundtobe97%.Nodifferencesofosseointegrationwereappreciatedbetweentheimmediateandlateplacementofimplantsafter splitridgeboneaugmentation.Theseresultsindicatethatthesplitridge technique is a valid procedure for augmentationofatrophicandknifeshapedalveolarridges. Incontrasttotraditionaltechniques,itallowsforimmediate implant placement following surgery anderadicatesthepossiblemorbidityfromasecondsurgicalsite.

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