COMPLEX OROFACIAL DEFECTS –A RECONSTRUCTIVE CHALLENGE

Authors: 1. Dr. Shiva Bharani K. S. N., Professor and Head,
Email: shivabharani74@gmail.com
2. Dr. Shubha Lakshmi S., Professor, Dept. of Oral & Maxillofacial Surgery
3. Dr. Rajay A. D. Kamath, Reader, Dept. of Oral & Maxillofacial Surgery
4. Dr. AmithHadhimane, Graduate, Dept. of Oral & Maxillofacial Surgery

Dept. of Oral & Maxillofacial Surgery,
College of Dental Sciences & Hospital, Davangere.

ABSTRACT: Introduction: Oral cavity cancèrs account for 30% of head and neck cancers and represent a significant challenge to clinicians. Treatment requires multidisciplinary expertise and is complicated by the complex role that the oral cavity plays in speech, mastication, and swallowing.Surgery remains the cornerstone of most treatment regimens; the primary objective is cure, notwithstandingpreservation of form and function to retain a good quality of life that can be further improved by reconstructive techniques using various local flaps, distant flaps ormicrovascular reconstruction. The pectoralis major [PM] flap has many advantages in that it is very reliable,and allows a single-stage reconstruction of most head and neck-defects to the level of the maxilla with well-vascularizedtissue capable of carrying a large skin paddle.The donor site morbidity is surprisingly low, and few patients complain of difficulties with arm movement.

Aims & Objectives: This paper revisits the surgical anatomy and technique of harvesting the Pectoralis Major myocutaneous flap used toreconstruct complex defects of the lower face following composite therapeutic resection. In addition, we describe our experience using this flap and discuss associated merits and demerits and complications.

Conclusion: Despite contemporary microvasculartechniques, the Pectoralis Major myocutaneousflap continues to be a versatile option in the reconstruction of complex head and neck defects following ablative surgery. However, regardless of the site, stage and degree of tumor differentiation, such cases will always pose as a therapeutic challenge to the reconstructive surgeon.

Key words: Oral cancer, Orofacial defects, pectoralis major myocutanoeus flap, reconstruction

INTRODUCTION:

Head and neck defects following tumor ablationpresent surgeons with some of the greatest challenges in reconstructive surgery. The intricate interaction between form, function, and appearance is greater in this anatomical sub site than any other. The importance of the face in social interactions, and the ability to speak and swallow, are central to quality of life. All of these variables and more must be taken into consideration when deciding upon the ideal reconstruction. Optimizing the surgical outcome in patients with head and neck defects depends upon the surgeon's ability and familiarity with different options that span the reconstructive continuum.

Typically, the reconstructive pyramid has been touted as the best approach to defects. In this pyramid, the reconstruction options begin with local tissue and progress to regional tissue reconstructions, and finally, to free tissue transfer. In many of these patients, however, the ideal approach requires skipping layers on the pyramid and starting with the most complex option.

The introduction of free tissue transfer has allowed the surgeon the options of tissue of different size, character, components (bone, muscle, skin, color, thickness), and function. Appropriate tissue can be transferred without the limitations of flap size, geometry, or pedicle length.

The ability to bring in healthy tissue from a remote location in a single stage increases the success of the reconstruction and decreases the amount of time that the patient is in rehabilitation. Today, the goal of modern head and neck reconstruction is a cosmetically appealing outcome that results in normal oromotor and facial functions. As with all reconstructive surgery, patient factors such as age, comorbidities, functional and nutritional status, and disease burden must play a role in the choice of technique used.

DISCUSSION:

Choices in Head and Neck Reconstruction:

As for reconstruction, the simplest technique that restores the highest level of cosmetic formand practical function is the best one. For the oral cavity, this sequenceof techniques progresses as follows:

1. Granulation and secondary intention
2. Primary closure
3. Split-thickness skin grafts or allogenic dermal grafts
4. Local advancement flaps
5. Regional flaps
6. Pedicled myocutaneous flaps
7. Free flaps

Pectoralis Major Myocutaneous flap -

Historical perspective: The Pectoralis Major Myocutaneous flap [PMMC] flap was first described by Ariyanin 1979 as a means of head and neck reconstruction following ablative cancer surgery. In 1947, the pectoralis major muscle had been reported as a local muscle flap for a chest wall defect, and in 1968 Heuston andMcConchieused a myocutaneous flap for repairing a sternal defect. It quickly became the cornerstone technique for reconstruction of large defects of the lower third of the face and neck. Despite the increased contemporary use of versatile microvascular free flaps, the PM flap continues to play a useful role in the reconstruction of traumatic and ablative head and neck defects.

A great many variations have been described. Surgeons have incorporated a costochondral segment or a portion of the sternum for simultaneous mandibular reconstruction.The use of a double paddle flap for through-and-through defects, with the skin islands either placed vertically above each other or side by side, also has been reported. Another method of obtainingtwo flaps from the same muscle, by splitting the skinand muscle vertically and basing one flap on the thoraco-acromial artery and one flap on the lateral thoracic artery was advocated by Tobin. To avoid the bulkiness associated with the flap, the pectoralis major also has been used as a pure muscle flap with or without skin grafting.

Anatomy:

The pectoralis major muscle is a large fan-shaped muscle that originates medially from thesternum, superiorly from the medial half of the clavicle, and inferomedially from theaponeurosis of the rectus abdominus muscle along the cartilaginous portion of the sixth rib.Thisinterdigitation of the pectoralis major and the rectus abdominus is noteworthy duringdissection to ensure separation the PM from this confluence while maintaining the attachmentof the rectus abdominus to the sixth rib. The action of the muscle causes medial rotation and adduction of the humerus.

The pectoralis major muscle is a type V muscle flap based on the MathesNahaiflapclassification with a dominant vascular pedicle and multiple secondary pedicles. The dominantpedicle is the pectoral branch of the thoracoacromial artery which is thefirst branch of the axillary artery that passes deep to the clavicle. The thoracoacromialtrunk has four branches: the deltoid, acromial, clavicular, and pectoral. The pectoral branchcourses inferiorly and enters the pectoralis major muscle from the deep surface.After giving off the thoracoacromial artery, the axillary artery continues deep to the insertionof the pectoralis minor muscle.

Immediately lateral to the pectoralis minor muscle, the lateralthoracic artery arises and parallels the pectoralis artery. The lateral thoracic artery providesvascularity to the lateral portion of the pectoralis major muscle. Perfusion studies have shownthis artery to be a significant source of blood supply to the pectoralis major in up to 27% of individuals.

Preservation of this vessel may improve flap viability but limit the arc of rotation.The pectoralis muscle also is supplied medially by the parasternal perforators from theinternal mammary artery.

The motor innervation to the pectoralis muscle is supplied by the medial and lateral pectoralnerves that are branches of the brachial plexus and they exit medial and lateral to thepectoralis minor muscle. Division of these nerves improves the arc of rotation of the flap andresults in atrophy of the flap.

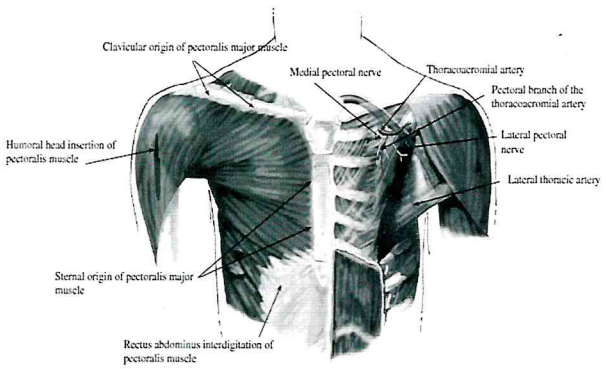


Fig. 1. Anatomy of the pectoralis major muscle with the muscle intact and removed.

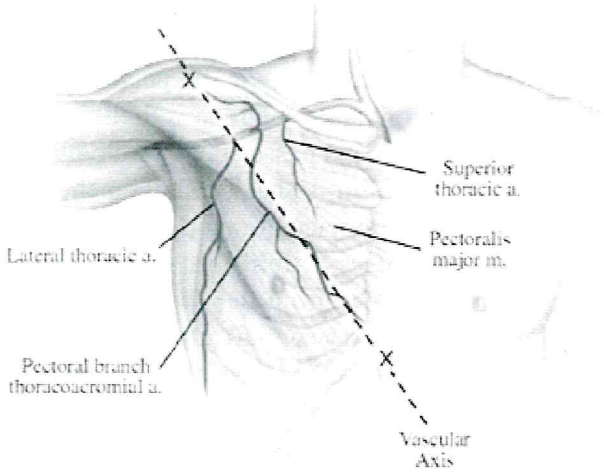


FIGURE 1. Illustration of the major blood supply to the pectoralis major myocutaneous flap.

Surgical technique:

The sternal notch and first three intercostal spaces are marked. Amark is then made in the mid-clavicular region to reference the anticipated exit of thethoracoacromial artery. The skin paddle island of desired shape and size is then drawn in the inferomedial quadrant of the pectoralis region between the nipple and edge of the sternum. The paddle should have minimal subcutaneous and mammary tissue. The distance from themid-clavicular point to the skin paddle should exceed the distance from the mid-clavicularpointto the head or neck defect [Fig. 1].

Fig.1: Composite defect seen following tumor ablation; surface markings indicating the probable location of the skin paddle and pedicle course of the PMMC.

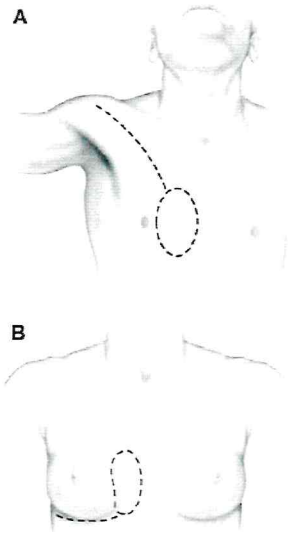
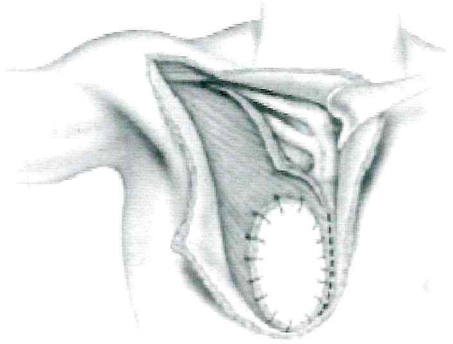


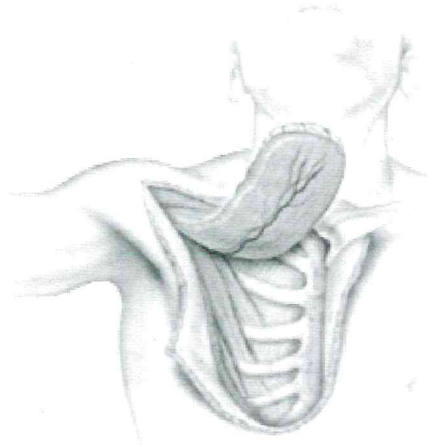
FIGURE 2. (A) Design of the incision for the pectoralis major myocutaneous flap. (B) Modification for females with placement of incision in the inframammary crease.

Fig 2a&b: Mid-pectoral incision for the PMMC flap in males; inframammary incision for the PMMC flap in females.

Two incision designs can be used for the exposure to the pectoral muscle: the mid-pectoralincision and the inframammary incision. Both designs are efficacious, with the inframammaryincision being considered more cosmetic.Inmales,a line is drawn from theupper, lateral border of the skin paddle to the axilla (the mid-pectoral incision)[Fig2a]. In women, the design is modified(the inframammary incision) to minimizecosmetic distortion of the breast. The skin-paddle incisionis placed off of the breast, and the incision is extendedalong the inframammary crease [Fig 2b].

The incision is carried down to the pectoralis fascia, andthe skin flaps surrounding the paddle are elevated superiorly,medially, and laterally. The superior skin flap iselevated over the clavicle and into the inferior neck tocreate a tunnel that allows access to the neck, and then tothe oral cavity, oropharynx, or facial skin. This tunnelshould be wide enough to allow passage of the pedicledportion of the flap, roughly the width of 3 to 4 fingers. Care is taken throughout this dissection not to accidentallyapply shearing forces to the skin paddle and disruptthe perforating blood supply from the underlying muscleto the skin. This can be facilitated by suturing the edges ofthe skin paddle to the underlying muscle with an absorbablesuture [Fig 3a,b&c].





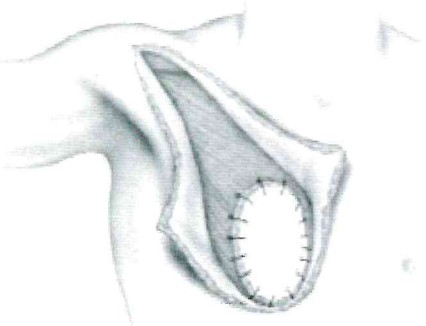


Fig 3a,b&c: Placement of circumferential tacking sutures to firmly secure the skin paddle to the underlying PMMC flap to prevent shearing of the sub-dermal plexus during flap harvesting following which the muscle is separated from its sternal and inferomedial as well as its lateral humeral attachment before defect in-setting.

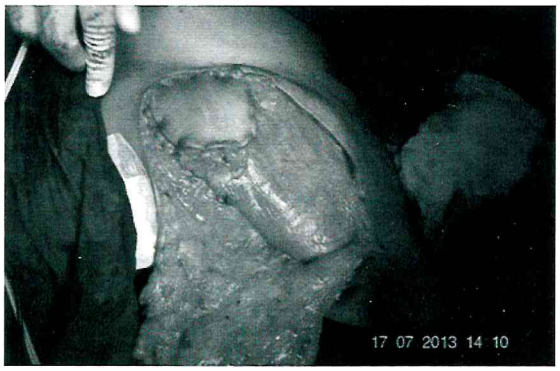


Fig 4: Separation of the muscle from its medial (sternal) and infero-medial attachments following placement of circumferential tacking sutures to stabilize the skin paddle.

Fig 5: Flap harvested in toto after separation from itslateral(humeral) attachment and is ready for in-setting in the resident oro-facial defect.

Next, the pectoralis muscle is incised medially along thelateral border of the lower half of the sternum, lateral to thefirst 2 intercostal perforators [Fig 4]. The inferior muscleattachments to the ribs are cut, and the muscle is dissectedsuperiorly off the chest wall, separating the pectoralismajor from the pectoralis minor.

The pectoralis branch ofthethoraco-acromial artery and its accompanying vein areidentified on the deepsurface of the muscle. Lastly, thehumeral attachments of the muscle are lysed, leaving thepectoralis major attached by its clavicular attachments andits vascular pedicle [Fig 5].

The muscle surrounding thevascular pedicle can then be thinned to lessen the musclebulk in the neck without compromising the flap. The flap isrotated 180 °, placed through the subcutaneous tunnel andover the clavicle. The flap is folded upward, taking care nottwist the flap at the pedicle, avoiding strangulation ofthe artery and vein. It is now in good position to bemaneuvered through the neck incision to close the surgicaldefect [Fig 6]. Suction drains are placed medially and laterally on the chest wall, and the donor-site defect is closed primarily.

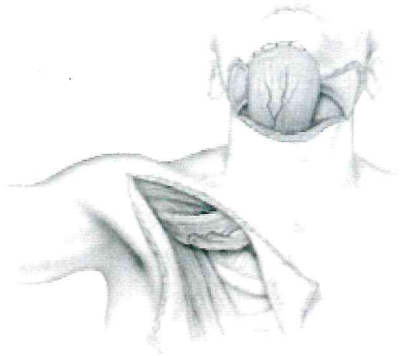


Fig 6a & b: Tunneling of the flap beneath the cervical skin to restore near form and function; closure of donor and recipient sites and placements of high-pressure (vacuum) thoracic and cervical drains to minimize seroma/hematoma formation.

Complications:

As with any surgery, risks and complications must be considered before surgery. PM flap complications can be subdivided into recipient-site complications and donor-site complications.Complications with the former include flap necrosis, poor healing, infections, fistulization, andseroma and the latter include uncontrolled bleeding, hematoma, wound dehiscence,infection, and seroma.

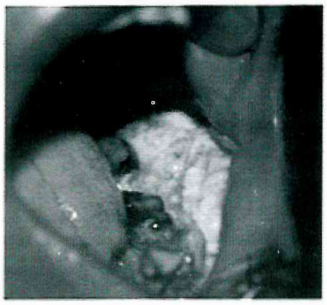
Surgical technique and planning are essential to minimizing complications. The use of skin paddles that extend caudally onto the rectus sheath to facilitate more cephalad coverage ofdefects has a greater incidence of partial flap necrosis. Compression of the pedicle either byimproper tunnel preparation or by improperly placed dressings, bandages, and tapes also shouldbe kept in mind.

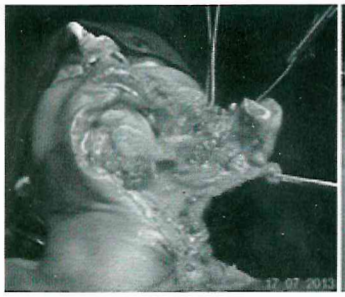
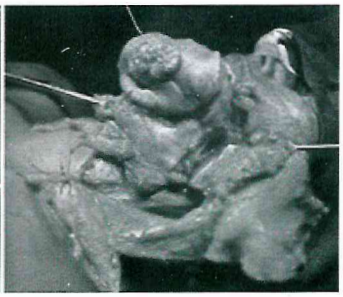
The bulk and weight of the PM flap also should be considered carefully, notonly because of aesthetic and functional matters but also because of problems with healing,tension, and increased risk for dehiscence. Attention to detail during preoperative planning andintraoperatively may minimize preventable causes of surgical complications.

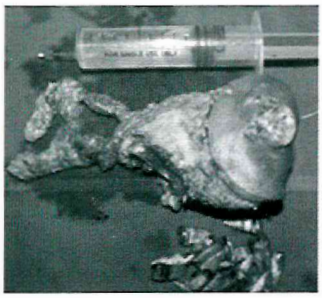
Our experience

Case 1

A 45-year old femalediagnosed with a moderately-differentiated squamous cell carcinoma of lower left gingivo-buccal sulcus underwent in-continuity (functional) neck dissection with wide excision of the tumor in conjunction with segmental mandibulectomy. A pectoralis major myocutaneous flap harvested from the upper, ipsilateral thorax for immediate obliteration of the composite defect.

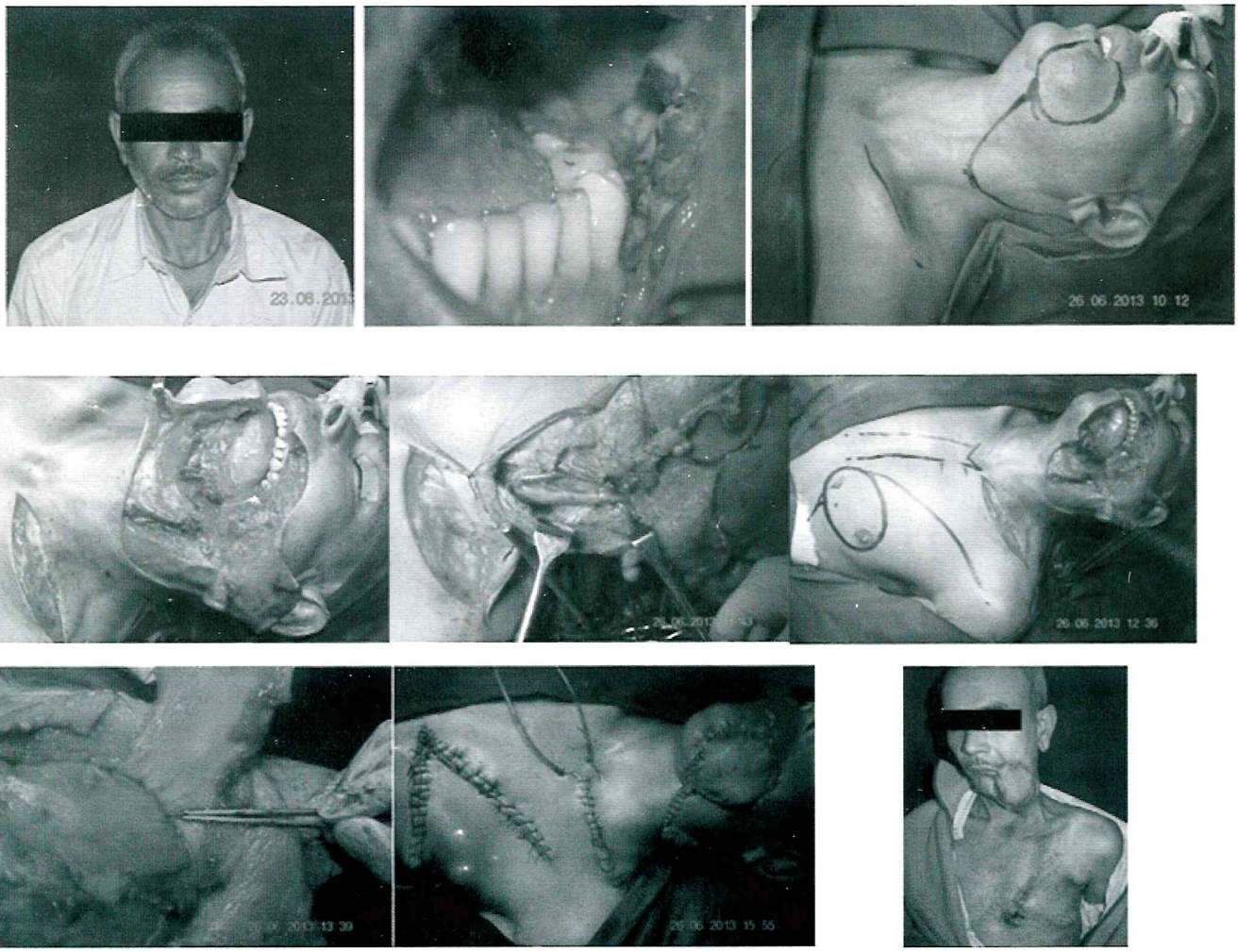



Case 2

A 50-year old male diagnosed with a moderately-differentiated squamous cell carcinoma of lower left alveolo-gingivo-buccal sulcus underwent in-continuity (functional) neck dissection with wide excision of the tumor in conjunction with segmental mandibulectomy. A pectoralis major myocutaneous flap harvested from the upper, ipsilateral thorax for immediate obliteration of the composite defect. Despite severe diabetes, the patient recovered remarkably and has now been referred to a regional cancer institute for radiation therapy.



CONCLUSION:

Despite major advances in head and neck reconstruction in the past fifteen years, the myocutaneous flap retains an important place in the surgeon's reconstructive armamentarium. Despite the advent of microvascular surgery, the pectoralis major myocutaneous flap still remains the preferred choice of reconstruction for most oro-facial defects due to its viability, vascularity and proximity to the defectand has been described as the 'work horse' of head and neck reconstruction. Its usefulness will most likely continue into the foreseeable future.

REFERENCES:

1. Gregory Farwell, Neal D. Futran: Flap choice in head and neck reconstruction Facial PlastSurgClin N Am 11 (2003) 107–119

2. Sherdon W. Cordova, Jonathan S. Bailey, Andonis G. Terezides: Pectoralis Major Myocutaneous Flap Reconstruction of the Mandible Atlas Oral Maxillofacial SurgClin N Am 14 (2006) 171–178

3. John P. Campana, Arlen D. Meyers: The Surgical Management of Oral Cancer Otolaryngol Clin N Am 39 (2006) 331–348

4. R.A. Ord: The Pectoralis Major Myocutaneous Flap in Oral and Maxillofacial Reconstruction: A Retrospective Analysis of 50 Cases J Oral MaxillofacSurg 54:1292-1295,1996.

5. Jatin P. Shah, Ziv Gil: Current concepts in management of oral cancer – Surgery
Oral Oncology 45 (2009) 394–401

6. Mark L. Urken: Atlas ofRegional and Free Flaps forHead and Neck ReconstructionRaven Press, New York

7. E.R.Carlson: Pectoralis Major Myocutaneous FlapOral Maxillofacial SurgClin N Am 15 (2003) 565–575

8. Ariyan S.: The pectoralis major myocutaneous flap: Aversatile flap forreconstruction in the head and neck. PlastReconstrSurg 63 (1979) 73-81