

# Local Flaps in Facial Reconstruction

A Defect Based Approach

Velupillai Ilankovan  
Madan Ethunandan  
Tian Ee Seah

*Second Edition*



Springer

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Second Edition

 Springer

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*To my parents for providing me with the opportunity to become a surgeon and my wife Regina, children Christopher and Victoria, for their support and tolerance over the years.*

— Velupillai Ilankovan

*To my parents for being excellent role models and giving me the opportunities and my wife Annie and daughter Tanuvi for all their support, sacrifices, love and friendship.*

— Madan Ethunandan

*To my parents whose unwavering care and support laid the foundation of my journey. To my wife, VicPearly, whose love and understanding have been my anchor throughout my career. To my daughter, Rachel, who is the love of our lives.*

— Tian Ee Seah

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## Preface

The first edition of the *Local Flaps in Facial Reconstruction—A Defect Based Approach* was published almost 7 years ago and has been well received across the world and translated into other languages. It was designed to help in the decision-making process and provide practical step-by-step information for reconstructing specific defects in the facial region.

The frequency of skin cancer continues to increase across the globe and clinicians from various backgrounds are involved in the care of these patients. Medical and surgical management of these conditions are rapidly changing, with targeted and patient-specific practices coming into the forefront. Reconstruction techniques should also be patient specific and “personalised”. The current edition has been “completely” updated with new text, excellent surgically relevant colour drawings and clinical photographs, to provide comprehensive practical solutions to facial defects confronted by the clinicians in day-to-day practice. New innovative solutions and modifications to established practices to facilitate individualised patient care have been described and descriptions of epidermal cell harvesting and nano fat stem cell injections have been included. The philosophy remains a problem-solving exercise using current knowledge and applications. The original ethos of a book that can be used in everyday practice, with scope for inclusion of personal comments is maintained.

Poole, Dorset, UK  
Southampton, UK  
Singapore, Singapore

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Tian Ee Seah

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# Contents

## Part I Foundations

<b>1</b>	<b>Local Anaesthesia</b> .....	3
	Types of Anaesthesia .....	3
	Important Common Steps .....	3
	Deciphering Drug Concentrations and Dilutions .....	4
	Tumescent Solution .....	5
	Sensory Nerve Supply to the Skin of Head and Neck .....	5
	Anaesthesia for Specific Areas .....	7
	Forehead .....	7
	Temple .....	9
	Cheek .....	11
	External Nose .....	13
	Lips .....	14
	External Ear/Pinna .....	16
	Scalp .....	18
	Neck .....	20
<b>2</b>	<b>Facial Units and Subunits</b> .....	23
	Forehead .....	27
	Cheek .....	29
	Nose .....	31
	Lips .....	33
	Chin .....	35
	Pinna .....	37
	Eyelids .....	39
	Scalp .....	41
	Neck .....	43
<b>3</b>	<b>Basic Flaps</b> .....	45
	Advancement Flaps .....	45
	Rotation Flap .....	48
	Transposition Flap .....	51
	Interpolated Flap .....	54
	Bilobed Flap .....	56



---

Island Flap . . . . .	59
Rhombic Flap . . . . .	63
Dog Ear Correction (Standing Cutaneous Deformity) . . . . .	67
<b>4 Decision-Making Process . . . . .</b>	<b>69</b>
 <b>Part II Reconstruction of Specific Defects</b>	
<b>5 Scalp Reconstruction . . . . .</b>	<b>73</b>
Subunits and Anatomical Considerations . . . . .	73
Central (Vertex) Defects . . . . .	78
Small Defects . . . . .	78
Medium-Sized Defects . . . . .	78
Rotation Flap . . . . .	78
O-Z Closure . . . . .	81
Multiple Rotation Flap (Pin Wheel Flap) . . . . .	84
Multiple Rhomboid Flaps . . . . .	87
Skin Graft (Full Thickness) . . . . .	89
Split Skin Graft . . . . .	93
Integra® and Skin Grafting . . . . .	96
Pericranial Flap and Skin Grafting . . . . .	100
Transposition Flap/Skin Grafting of Secondary Defect . . . . .	104
Recell . . . . .	108
Lateral Defects . . . . .	110
Small Defects . . . . .	110
Medium-Sized Defects . . . . .	110
Bilateral Advancement Flap . . . . .	112
Rotation/Transposition Flaps . . . . .	114
Suggested Algorithm . . . . .	117
Central (Vertex) Defects . . . . .	117
Lateral Defects . . . . .	117
<b>6 Forehead Reconstruction . . . . .</b>	<b>119</b>
Subunits and Anatomical Considerations . . . . .	119
Central Defects (Between the Medial End of the Eyebrows) . . . . .	122
Elliptical Excision . . . . .	122
M & W Flaps . . . . .	124
Upper Forehead . . . . .	126
Lower Forehead . . . . .	128
Upper and Lower Forehead . . . . .	130
Bilateral Advancement Flap . . . . .	132
Paramedian Defects (Between Medial End of the Eyebrow and Lateral Orbital Rim) . . . . .	134
Elliptical Excision . . . . .	134
Unilateral/Bilateral Advancement Flaps . . . . .	136

Lower Forehead . . . . .	138
Upper Forehead. . . . .	142
Lateral Forehead/Temple (Between the Lateral Orbital Rim and Zygomatic Arch) . . . . .	142
V-T Flap . . . . .	142
Rotation/Transposition Flap . . . . .	145
Rhombic Flap (Limberg Flap) . . . . .	147
Unilateral/Bilateral Advancement Flaps. . . . .	150
Forehead Rotation Flap. . . . .	152
Cervical/Cheek Rotation Flap. . . . .	154
Multiple Transposition Flaps ± Skin Grafts . . . . .	156
Skin Graft . . . . .	159
Suggested Algorithm. . . . .	161
Forehead . . . . .	161
Large Defects . . . . .	162
<b>7 Nose . . . . .</b>	<b>163</b>
Subunits and Anatomical Considerations . . . . .	163
Nasal Dorsum Defects . . . . .	165
Primary Closure (Vertical) . . . . .	165
Primary Closure (Horizontal) . . . . .	167
Glabellar Advancement Flap. . . . .	169
Glabella Transposition Flap . . . . .	172
Nasal Tip Defects . . . . .	174
Primary Closure . . . . .	174
Skin Graft . . . . .	174
Bilobed Flap . . . . .	176
Sidewall Defects . . . . .	180
Primary Closure . . . . .	180
Skin Grafts . . . . .	180
Glabella Transposition Flap . . . . .	180
Bilobed Flap (Laterally Based). . . . .	184
Bilobed Flap (Medially Based). . . . .	187
Apron Flap . . . . .	190
Ala Defects . . . . .	195
Island Advancement Flap . . . . .	195
Bilobed Flap (Laterally Based). . . . .	198
Bilobed Flap (Medially Based). . . . .	200
Nasolabial Flap (Inferiorly Based) . . . . .	202
Two-Stage Melolabial Flap. . . . .	204
Paramedian Forehead Flap . . . . .	207
Apron Flap . . . . .	211
Columella . . . . .	211
Primary Closure (Vertical/Horizontal) . . . . .	211

Skin Graft . . . . .	211
Two-Stage Melolabial Flap . . . . .	213
Suggested Algorithm . . . . .	213
Dorsum . . . . .	213
Nasal Tip . . . . .	213
Columella . . . . .	213
Side Wall . . . . .	213
Ala . . . . .	214
Paramedian Forehead Flap . . . . .	214
<b>8 Eyelids . . . . .</b>	<b>215</b>
Subunits and Anatomical Considerations . . . . .	215
Upper Eyelid . . . . .	218
Anterior Lamella Defects . . . . .	218
Full-Thickness Defects . . . . .	231
Lower Eyelid . . . . .	235
Anterior Lamella Defects . . . . .	235
Full-Thickness Defects . . . . .	241
Suggested Algorithm . . . . .	258
Upper Eyelid . . . . .	258
Lower Eyelid . . . . .	258
<b>9 Auricular Reconstruction . . . . .</b>	<b>261</b>
Subunits and Anatomical Considerations . . . . .	261
Special Considerations . . . . .	264
Concha (Cymba and Cavum) . . . . .	264
Antihelix . . . . .	282
Helical Rim/Antihelix Extending to Helical Rim . . . . .	286
Triangular Fossa . . . . .	304
Tragus . . . . .	308
Posterior Surface of Pinna . . . . .	312
Lobule . . . . .	322
Suggested Algorithm . . . . .	324
Concha . . . . .	324
Antihelix/Helix . . . . .	324
Triangular Fossa . . . . .	324
Tragus . . . . .	324
Posterior Surface of Pinna . . . . .	325
Lobule . . . . .	325
<b>10 Cheek Defects . . . . .</b>	<b>327</b>
Subunits and Anatomical Considerations . . . . .	327
Medial Subunit . . . . .	330
Primary Closure . . . . .	330
Island Advancement Flap . . . . .	334
Buccal Subunit . . . . .	339

Primary Closure . . . . .	339
Rhombic Flap . . . . .	341
Laterally Based Rotation/Transposition Flap . . . . .	343
Inferiorly Based Rotation Advancement Flap . . . . .	347
Zygomatic Subunit . . . . .	350
Primary Closure . . . . .	350
Rhombic Flap . . . . .	352
Rotation/Transposition Flap . . . . .	355
Island Advancement Flap . . . . .	358
Mandibular Subunit . . . . .	360
Primary Closure . . . . .	360
Rhombic Flap . . . . .	360
Rotation/Transposition Flap . . . . .	364
Lateral Subunit . . . . .	367
Primary Closure . . . . .	367
Asymmetric Primary Closure . . . . .	367
Rhombic Flap . . . . .	370
Bilobed Flap . . . . .	370
Suggested Algorithm . . . . .	373
Medial . . . . .	373
Buccal . . . . .	373
Zygomatic Unit . . . . .	373
Mandibular . . . . .	373
Lateral Unit . . . . .	374
<b>11 Lips/Chin . . . . .</b>	<b>375</b>
Lips . . . . .	375
Subunits and Anatomical Considerations . . . . .	375
Lower Lip . . . . .	378
Skin Only . . . . .	378
Mucosa Only . . . . .	387
Full-thickness Defects . . . . .	390
Bilateral Advancement Flap . . . . .	404
Bilateral Commissurotomy and Advancement of Skin, Muscle, and Mucosal Flaps . . . . .	406
Upper Lip (Philtrum/Lateral) . . . . .	413
Skin Only (Consider Converting to Full Thickness) . . . . .	413
Full-Thickness Defects . . . . .	432
Philtrum/Lateral Defects . . . . .	432
Chin Defects . . . . .	443
Suggested Algorithm . . . . .	455
Lips . . . . .	455
Upper/Lower Lip (Chronic Ulcers/Atrophy) . . . . .	456

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<b>12 Neck Defects</b> .....	457
Subunits and Anatomical Considerations .....	457
Central Neck .....	460
Lateral Neck .....	467
Posterior Neck .....	474
Suggested Algorithm .....	481
Central Neck .....	481
Lateral Neck .....	481
Posterior Neck .....	481
 Algorithms for Specific Sites .....	483
Scalp .....	483
Forehead .....	484
Nose .....	485
Eyelids .....	487
Ear .....	488
Cheek .....	489
Lips .....	491
Neck .....	493
 <b>Index</b> .....	495

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**Part I**

**Foundations**

# Local Anaesthesia

# 1

## Types of Anaesthesia

Topical, infiltration, field block, nerve block.

## Important Common Steps

Prepare skin using sterile technique.

Always aspirate before injecting local anaesthetic solution.

Aware of maximum doses (Table 1.1).

Knowledge of recognising and managing toxicity/complications.

**Table 1.1** Duration of action and maximum doses of common local anaesthetic agents

Anaesthetic	Duration without adrenaline/ vasoconstrictor (min)	Duration with adrenaline/ vasoconstrictor (min)	Maximum dose without adrenaline/ vasoconstrictor (mg/kg)	Maximum dose with adrenaline/ vasoconstrictor (mg/kg)
<b>Esters</b>				
Cocaine	45	–	2.8	–
Procaine	15–30	30–90	7.1	8.5
Chloroprocaine	30–60	–	11.4	14.2
Tetracaine	120–240	240–480	1.4	–
<b>Amides</b>				
Lignocaine	30–120	60–240	4.5	7
Mepivacaine	30–120	45–180	4.5	7
Bupivacaine	120–240	240–480	2.5	3.2
Etidocaine	200	240–360	4.2	5.7
Prilocaine	30–120	60–400	5.7	8.5

## Deciphering Drug Concentrations and Dilutions

**Concentrations:** Drug concentration is expressed as a percentage (e.g. Bupivacaine 0.25%, Lignocaine 1%).

Percentage is measured in grams per 100 mL (i.e. 1% is 10 mg/mL, 1 g/100 mL, 1000 mg/100 mL).

Calculate the mg/mL concentration quickly from the percentage by moving the decimal point 1 place to the right, as follows:

Bupivacaine 0.25% = 2.5 mg/mL

Tetracaine 0.5% = 5 mg/mL

Lignocaine 1% = 10 mg/mL

Lignocaine 2% = 20 mg/mL

Benzocaine 20% = 200 mg/mL

**Dilutions:** When adrenaline is combined with an anaesthetic solution, the result is expressed as a dilution (e.g. 1:100,000).

1:1000 means 1 mg per 1 mL (i.e. 0.1%)

1:10,000 means 1 mg per 10 mL (i.e. 0.01%)

1:2000 means 1 mg per 2 mL (i.e. 0.05%)

1:20,000 means 1 mg per 20 mL (i.e. 0.005%)

0.1 mL of 1:1000 adrenaline added to 10 mL of anaesthetic solution = 1:100,000 dilution, or 0.01 mg/mL

**Adrenaline content examples:** From the information provided in Table 1.2 below, 50 mL of 1% lignocaine with adrenaline 1:100,000 contains 500 mg of lignocaine and 0.5 mg of adrenaline.

**Table 1.2** Adrenaline content in solution

Solution volume	1:100,000 (1 mg/100 mL)	1:200,000 (1 mg/200 mL)
1 mL	0.01 mg	0.005 mg
5 mL	0.05 mg	0.025 mg
10 mL	0.1 mg	0.05 mg
20 mL	0.2 mg	0.1 mg



## Tumescent Solution

Various combinations are described in the literature. The aim is to make the tissue planes “turgid” and to offer anaesthesia and haemostasis over a large area, while using the least amount of anaesthetic solution and minimising the systemic side effects. Our combination is as follows:

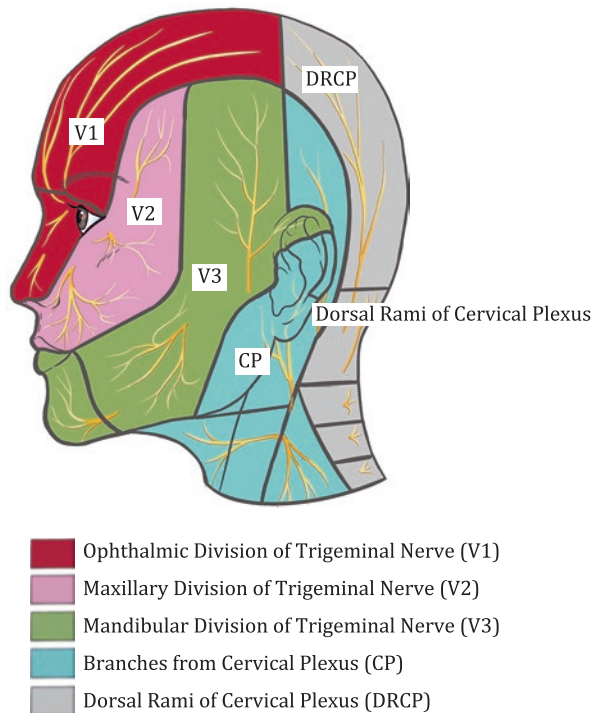
1. Normal saline—500 mL
2. 1% plain lignocaine—50 mL
3. 1:1000 adrenaline—1 mL
4. 10% sodium bicarbonate—6 mL

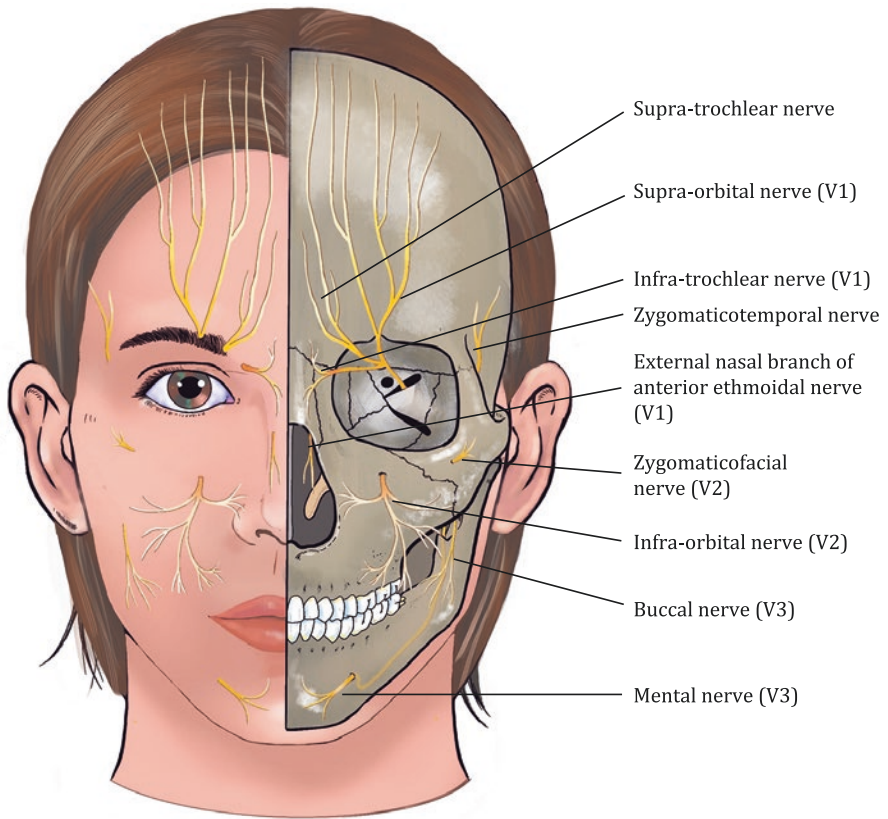
## Sensory Nerve Supply to the Skin of Head and Neck

The cutaneous sensory nerve supply of the head and neck region is principally by the branches of the trigeminal nerve and cervical plexus, with smaller contributions from the other cranial nerves (Figs. 1.1 and 1.2).

Most of these nerves can be anaesthetised by nerve blocks, enabling surgical procedures to be carried out under local anaesthesia in addition to helping with post-operative analgesia.

**Fig. 1.1** Sensory nerve supply of the head and neck





**Fig. 1.2** Sensory nerves of the skin of the head and neck region and its relationship with the facial skeleton

---

## Anaesthesia for Specific Areas

### Forehead

**Nerves:** Supra-orbital, Supra-trochlear (Figs. 1.2 and 1.3).

### Landmarks

**Supra-orbital N:** Emerges from the supra-orbital foramen along the vertical plane of the pupil.

**Supra-trochlear N:** Medial end of eyebrow, about 1.5 cm from midline.

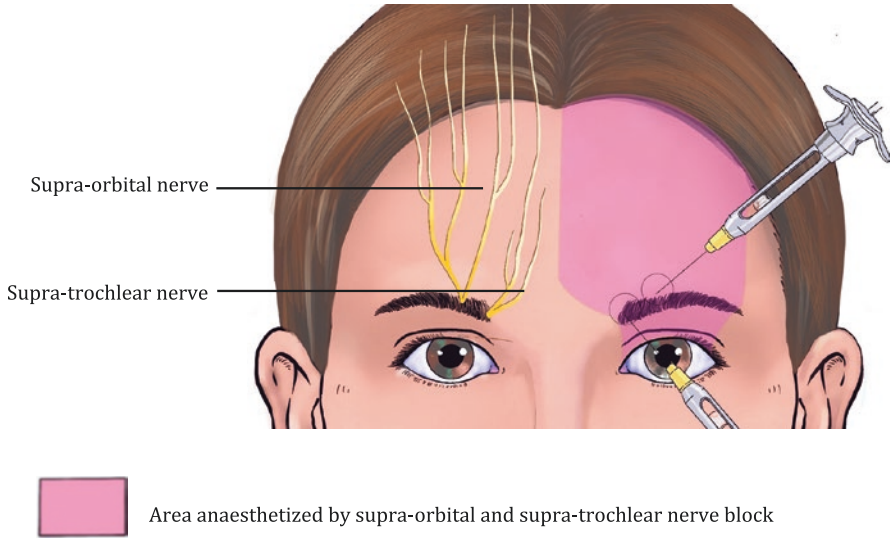
### Technique

**Supra-orbital Nerve:** Prepare skin using sterile technique. Request patient to look straight forward, palpate supra-orbital ridge and locate supra-orbital notch/foramen along vertical plane of pupil. Insert needle and raise a small skin wheal, advance needle 3–4 mm and deposit solution superior to foramen in a supra-periosteal location ( $\pm 2$  mL).

**Supra-trochlear Nerve:** Insert needle medial end of eyebrow, 1.5 cm from the midline and infiltrate anaesthetic in the subcutaneous tissues. Advance needle across the midline and deposit solution in a similar location to anaesthetise the contralateral nerve.

### Area of Anaesthesia

**Forehead:** Up to lateral canthus, anterior scalp up to coronal plane.



**Fig. 1.3** Supra-orbital, supra-trochlear nerve block

## Temple

**Nerves:** Zygomaticotemporal, Auriculotemporal (Figs. 1.2 and 1.4).

### Landmarks

**Zygomaticotemporal N:** Emerges from the zygomaticotemporal foramen and pierces the temporal fascia 2.5 cm above the medial end of the zygomatic arch.

### Technique

Prepare skin using sterile technique. Insert needle 2.5 cm above the medial end of the zygomatic arch, lateral to the lateral orbital rim and deposit solution into the subcutaneous tissues.

### Area of Anaesthesia

Lateral forehead, medial temple.

### Landmarks

**Auriculotemporal N:** Arises from the mandibular division of the trigeminal nerve, passes posterior to the neck of the condyle, runs superiorly crossing the root of zygomatic arch.

### Technique

Prepare skin using sterile technique. Insert needle 2 cm above the tragus, just anterior to the superior attachment of the helix to the scalp and deposit solution into the subcutaneous tissues.

### Area of Anaesthesia

Lateral temple, tragus, superior helix.

### Caution

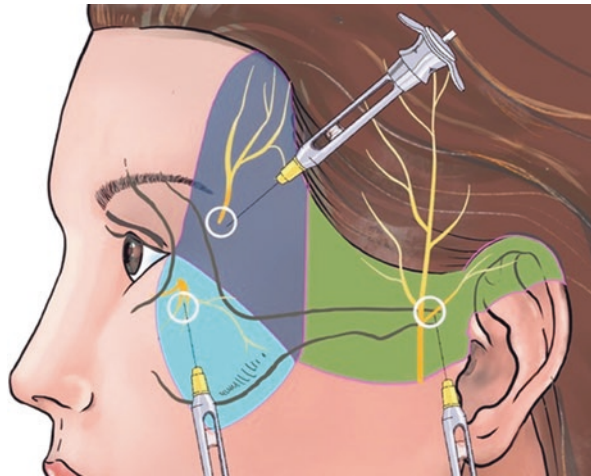
Avoid intra-vascular injection into superficial temporal vessels.




Risk of bruising, haematoma.

**Paralysis:** Temporal branch of facial nerve.

**Image—Also see ear anaesthesia**

**Fig. 1.4** Zygomaticotemporal, zygomaticofacial, auriculotemporal nerve block



-  Zygomaticofacial nerve
-  Zygomaticotemporal nerve
-  Auriculotemporal nerve

## Cheek

**Nerves:** Zygomaticofacial, infra-orbital (Figs. 1.2, 1.4, and 1.5).

### Landmarks

**Infra-orbital N:** Emerges from the infra-orbital foramen along the vertical plane of the pupil, 1.5 cm below the bony infra-orbital rim.

### Technique

Prepare skin using sterile technique. Ask patient to look straight ahead, palpate infra-orbital rim and insert needle 2 cm below infra-orbital rim along the vertical plane of the pupil. Deposit solution above periosteum, close to infra-orbital foramen.

### Area of Anaesthesia

Cheek, lower eyelid, lateral nose, upper lip.

### Landmark

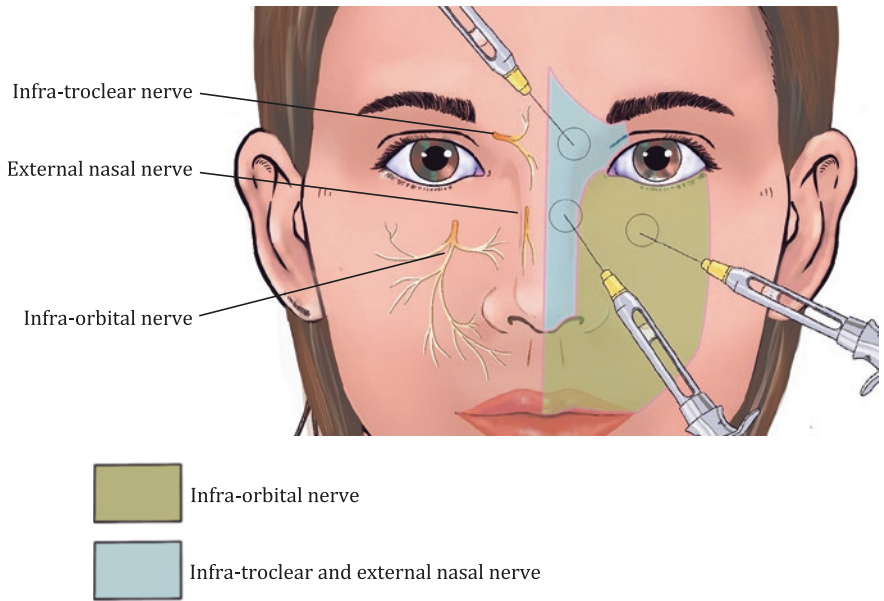
**Zygomaticofacial Nerve** (Figs. 1.2 and 1.4): Emerges from the zygomaticofacial foramen, 2 cm below and lateral to the lateral canthus.

### Technique

Prepare skin using sterile technique. Insert needle 2 cm below and lateral to the lateral canthus. Deposit solution above periosteum, close to the nerve.

### Area of Anaesthesia

Skin overlying zygomatic prominence, lateral lower eyelid.



**Fig. 1.5** Infra-orbital, infra-trochlear and external nasal nerve block



## External Nose

**Nerves:** Infra-orbital, infra-trochlear, external nasal (Figs. 1.2 and 1.5).

### Landmarks

**Infra-trochlear N:** Branch of the nasociliary nerve and emerges from the upper eyelid, 1 cm above the medial canthus.

### Technique

Prepare skin using sterile technique. Insert needle 1 cm above medial canthus and infiltrate anaesthetic into the subcutaneous tissues.

### Area of Anaesthesia

Upper nose, medial upper eye lid.

### Landmark

**External nasal N:** Terminal branch of ethmoid nerve, emerges from the lower margin of the nasal bone, run on the surface of the upper lateral/alar cartilage, to the tip of nose, 1 cm from the midline.

### Technique

Prepare skin using sterile techniques. Insert needle 1 cm lateral to midline, just inferior to the junction of nasal bone and upper lateral cartilage and deposit anaesthetic in the subcutaneous tissues.

### Area of Anaesthesia

Mid, lower nose.

### Landmark

**Infra-orbital N:** Emerges from the infra-orbital foramen along the vertical plane of the pupil, 1.5 cm below the bony infra-orbital rim.

### Technique

Prepare skin using sterile technique. Ask patient to look straight ahead, palpate infra-orbital rim and insert needle 2 cm below infra-orbital rim along the vertical plane of the pupil. Deposit solution above periosteum, close to infra-orbital foramen.

### Area of Anaesthesia

Cheek, lower eyelid, lateral nose, upper lip.

## Lips

### Upper Lip

**Nerves:** Infra-orbital (see Fig. 1.5).

### Landmark

**Infra-orbital N:** Emerges from the infra-orbital foramen along the vertical plane of the pupil, 1.5 cm below the bony infra-orbital rim.

### Technique

Prepare skin using sterile technique. Ask patient to look straight ahead, palpate infra-orbital rim and insert needle 2 cm below infra-orbital rim along the vertical plane of the pupil. Deposit solution above periosteum, close to infra-orbital foramen.

### Area of Anaesthesia

Cheek, lower eyelid, lateral nose, upper lip.

### Lower Lip/Chin

**Nerves:** Mental nerve (Fig. 1.6).

### Landmark

**Mental N:** Emerges from the mental foramen, 2 cm above the lower border of mandible, along the vertical plane of pupil.

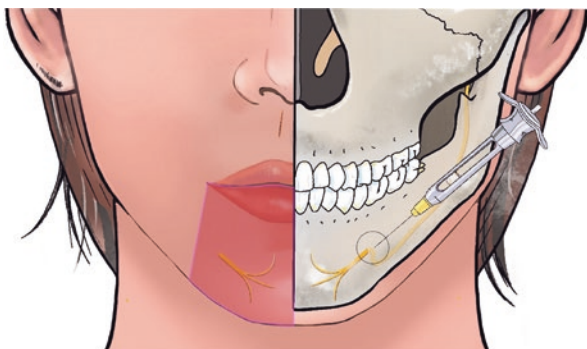
### Technique

Prepare skin using sterile techniques. Ask patient to look straight ahead. Palpate lower border of mandible and insert needle 2 cm above lower border, along the vertical plane of the pupil. Deposit solution in the supra-periosteal plane close to the mental foramen.

### Area of Anaesthesia

Lower lip, chin.

**Fig. 1.6** Mental nerve block



Mental nerve

## External Ear/Pinna

**Nerves:** Great auricular (C2,C3), lesser occipital (C2), auricular branch of vagus, auriculotemporal (Fig. 1.7a and b).

### Technique

Prepare skin using sterile technique. Insert needle into skin below the attachment of the earlobe and raise small skin wheal. Advance needle anteriorly/superiorly towards the tragus, depositing solution along the way. Withdraw needle, but do not remove and redirect posteriorly/superiorly along auriculocephalic sulcus and deposit anaesthetic. Remove needle and reinsert just above attachment of helix and direct needle anteriorly/inferiorly towards tragus, depositing solution along the way. Withdraw needle, but do not remove and redirect posteriorly/inferiorly along auriculocephalic sulcus and deposit anaesthetic. Make sure that the solution is deposited all around the base of the pinna. Additional infiltration is required in the concha, to anaesthetise the area supplied by the auricular branch of vagus (Fig. 1.7c–e).

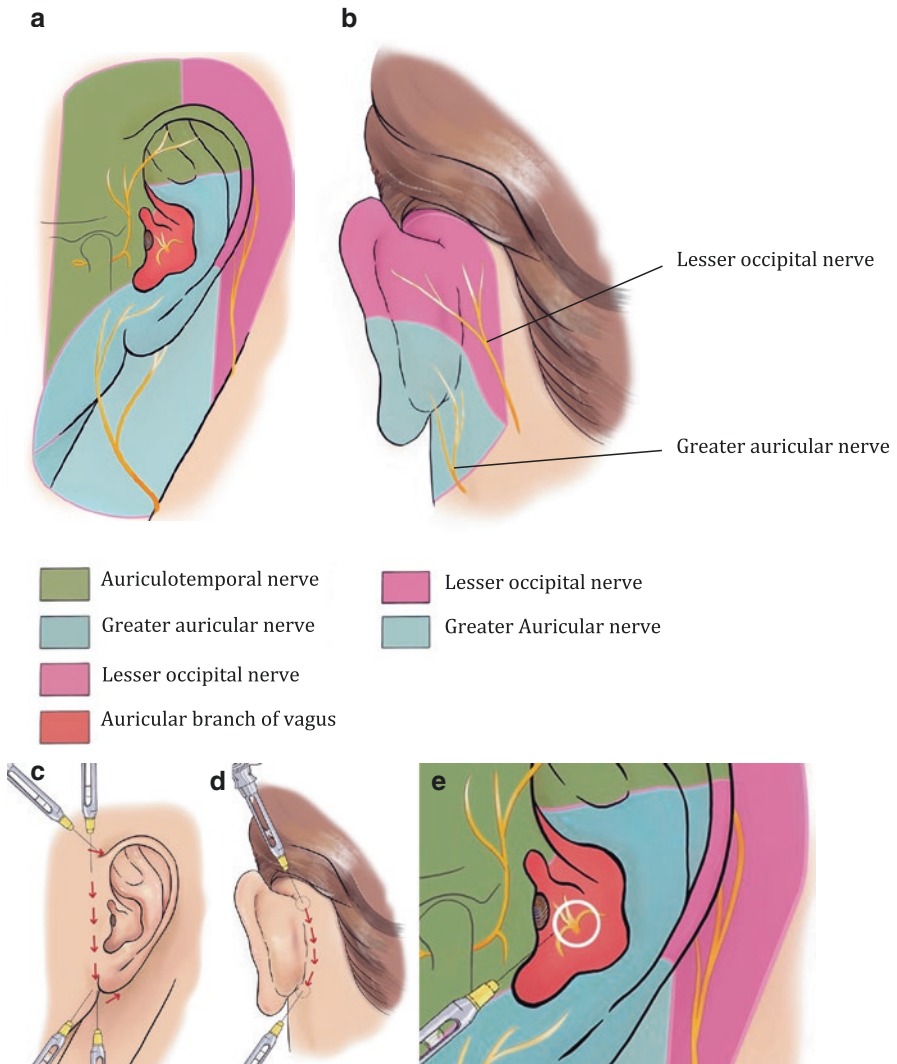
### Area of Anaesthesia

**Great auricular:** Skin overlying angle of mandible, lower/middle cranial surface of pinna and ear lobe.

**Lesser occipital:** Posterior scalp adjacent to pinna and upper/middle cranial surface of pinna.

**Auriculotemporal:** Upper part of lateral surface of pinna and part of meatal skin.

**Auricular branch of vagus:** Part of meatal and adjacent conchal skin.



**Fig. 1.7** (a) Nerve supply external ear/pinna, (b) Nerve supply external ear/pinna—posterior surface, (c) Local anaesthesia for pinna, (d) Local anaesthesia for pinna, (e) Vagus branch block for conchal area

## Scalp

**Nerves:** Supra-trochlear, supra-orbital, zygomaticotemporal, auriculotemporal, lesser occipital (C2), greater occipital (C2), third occipital (C3) (Figs. 1.1, 1.2, 1.3, 1.4, and 1.8a, b).

### Technique

For anaesthesia of the anterior and lateral scalp see Figs. 1.3 and 1.4.

**Greater Occipital/Third occipital:** Request patient to sit forward and slightly flex head. Prepare skin using sterile technique. Palpate external occipital protuberance. Insert needle 2 cm lateral and 2 cm inferior to external occipital protuberance and deposit solution in a fan-shaped manner in the subcutaneous plane (Fig. 1.8a).

**Lesser occipital:** With the patient in the same position, palpate the mastoid process and insert needle 2 cm above the tip of the mastoid process. Deposit solution in a fan-shaped manner in the subcutaneous tissue (Fig. 1.8b).

### Area of Anaesthesia

**Great occipital:** Majority of posterior scalp up to vertex.

**Third occipital:** Small area of lower part posterior scalp.

**Lesser occipital:** Scalp posterior and superior to pinna.

### Caution

Intra-vascular injection/damage to occipital artery.