Index

Page numbers in *italics* refer to figures; note that figures are only indicated when they are separated from their text references.

- accreditation 84–66
- acetylcysteine 125
- advantages
  - percutaneous vs open surgical tracheostomy 41–45
  - tracheostomy vs translaryngeal intubation 21, 35–40
- aftercare 121–129
- air leaks 106, 107–108
- airway damage 105–107
  - see also tracheal damage
- airway management, intraoperative 72–73
- airway obstruction
  - postoperative 102, 115, 117–118, 121
  - upper 21–22
- anaesthesia 72–75
  - awareness 73–74
  - checklist 75
  - sequence 74–75
  - translaryngeal airway management 72–73
- anaesthetists 71, 72
- emergency tracheostomy 33
  - percutaneous tracheostomy by 42, 85
- anatomy, tracheal 11–20
- ansa cervicalis 15
- anterior jugular vein 15, 16
  - damage 98
  - midline position 18–19, 31, 101
- arteries, neck 15, 17
  - damage 100
  - pre-procedure assessment 76, 92
  - variability 98–99
- aspiration, gastrointestinal contents 124, 149
- audit forms 145, 147
- awareness, anaesthetic 73–74
- bleeding see haemorrhage/bleeding
- blood clots, suctioning 102–103
- blood vessels
  - anatomy 15–19
  - pre-procedure assessment 76, 92–93, 141
- blue dye test 149
- Blue Rhino kit (Cook) 7, 51
- popularity 8, 48, 49
- technique of use 51–52
- blunt dissection 77–78, 79, 101, 134
- bougie, gum elastic 72–73
- brachiocephalic see innominate
- Brasavola, Antonio Musa 3
- breathing, work of 38
- bronchoscope, fiberoptic
  - needle damage 75, 76, 89, 91, 95, 98
  - translumination 78, 87, 132, 133
- bronchoscopy, fiberoptic 44, 75, 87–91
- Fantoni technique 56, 57
- frequency of use 8
- guidance of needle entry 78, 87, 132, 133
- to locate existing stoma tract 139
- recommendation 91
- role 87–88, 137
- verification of tube placement 82–83
- vs blind tracheal puncture 88–89
- bulbar competence, assessment 124, 149
- capnography 8, 94
- carotid artery 12, 98
carotid sheath 15
cartilaginous rings, tracheal 11
insertion of dilators between 133–134
mechanisms of injury 112, 113
nutrition 17
catheter, airway exchange 72–73
cellulitis 116, 118
cervical plexus 19
cervical spine
anatomical distortions 11, 13
injuries 29
chest X-rays 76, 83
children 23, 30, 56
complications 95, 106
chronic obstructive pulmonary disease (COPD) 26, 77
Ciaglia, Pasquale 5, 7
Ciaglia sequential dilator kit (Cook) 5, 50
complications 97
popularity 8, 48, 49
technique of use 49–51
vs Blue Rhino kit 51–52
cleaning swab, TRACOE® 68
clots, blood, suctioning 102–103
clotting studies 72
coagulopathy 29, 30, 32, 36
Combitude 73, 74
comfort, patient 21, 25–26, 35, 36
communication 123
aids to non-verbal 70, 123
verbal 36–38, 69–70
complications, percutaneous tracheostomy 95–120
classification 95, 96
vs open surgical tracheostomy 41, 42, 44–45, 97
consent 71
contraindications to tracheostomy 29–33
Cook Blue Rhino kit see Blue Rhino kit
Cook Ciaglia sequential dilator kit see Ciaglia sequential dilator kit
cosmetic outcome 42, 44, 143
cost-effectiveness, percutaneous tracheostomy 42
cough
assessment of adequacy 127–128
inadequate 23
cricoid cartilage 11, 12, 17
cricothyroid 12
cricothyroidotomy 58–60
emergency devices 59–60
patient with short fat neck 140–141
small-bore see mini-tracheostomy
cricotracheal ligament 11
cuffs, tracheostomy tube 65–66
deflation
to allow speech 69–70
synchronised with suctioning 125
inflation 126, 137
pressure measurement 65, 114
role in tracheal stenosis 114–115
streamlining, to ease insertion 134–135
dead space, anatomical 38
decannulation 44, 127–129
assessment of readiness 127–128
synchronised suction/cuff deflation technique 125
digital pressure, to control bleeding 101, 142
dilatation sequence 79, 80
dilators 49–52
sequential 49–51
single-step 49, 51–52
size of tracheostomy tube for loading 135, 136
tamponade of bleeding 101, 142
tips for easing insertion 133–135
diphtheria 4
disadvantages
percutaneous tracheostomy 41–42
tracheostomy 40
translaryngeal intubation 39
dissection, blunt 77–78, 79, 101, 134
<table>
<thead>
<tr>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>documentation 86, 145, 147</td>
</tr>
<tr>
<td>'double insult' 23, 39-40</td>
</tr>
<tr>
<td>dressings, stoma 126</td>
</tr>
<tr>
<td>early tracheostomy, indications 23, 24, 28</td>
</tr>
<tr>
<td>Egypt, ancient 1-2</td>
</tr>
<tr>
<td>elderly 15</td>
</tr>
<tr>
<td>blood vessels in neck 11, 13</td>
</tr>
<tr>
<td>tracheal angulation 14</td>
</tr>
<tr>
<td>tracheal position 14</td>
</tr>
<tr>
<td>emergency cricothyroidotomy 59-60</td>
</tr>
<tr>
<td>emergency percutaneous tracheostomy 32-33</td>
</tr>
<tr>
<td>emphysema, surgical 64, 106, 107-108</td>
</tr>
<tr>
<td>endobronchial devices, double lumen 69</td>
</tr>
<tr>
<td>endotracheal intubation see translaryngeal intubation</td>
</tr>
<tr>
<td>endotracheal (ET) tube bronchoscope passage down 89-90, 91</td>
</tr>
<tr>
<td>Fantoni technique 56, 57</td>
</tr>
<tr>
<td>intraoperative management 72-73, 75, 78-80</td>
</tr>
<tr>
<td>occlusion risks 35</td>
</tr>
<tr>
<td>percutaneous puncture 95</td>
</tr>
<tr>
<td>equipment aids 87-94 anaesthetic 75 surgical procedure 76-77 tracheostomy care 122</td>
</tr>
<tr>
<td>ET see endotracheal experience, operator 48, 71, 76, 85 external jugular vein 15 extubation, repeated trials 23, 26, 38</td>
</tr>
<tr>
<td>family 71 Fantoni translaryngeal method 7, 49, 55-57 in bleeding disorders 32 in children/young adults 30, 56 relative safety 44, 55-56 usage 49</td>
</tr>
<tr>
<td>follow-up 127-129 forceps blunt dissection 78, 134 dilating, techniques using 49, 52-55 glottis, erosions 26 goitre 69, 78 granulomas, stoma site 112, 113 Griggs technique 6, 54-55 complications 32 usage 49 Guillain Barré syndrome 26 haemorrhage/bleeding 95 early 98-103 late 103-105 methods of reducing 141-142 percutaneous vs surgical tracheostomy 41, 44, 45 points, tie-off 142 preventive strategies 100-101 head up tilt 77, 141 heat moisture exchange (HME) filter 124 heparin 72 history of tracheostomy 1-9 early references 1-4 percutaneous technique 4-8 homunculus, motor and sensory 21, 22, 35, 37 humidification 123-124 hypercapnia 90, 95 hyperventilation 89-90 hypoxaemia/hypoxia 89-90, 95 incision, skin 77, 79, 142 depth 142 orientation 143 size 141, 143 indications for tracheostomy 21-23, 24 infections, stoma 116-117, 118 tracheo-innominate vein/artery fistula 105 vs open surgical tracheostomy 41, 44, 45</td>
</tr>
<tr>
<td>Term</td>
</tr>
<tr>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>inferior thyroid artery</td>
</tr>
<tr>
<td>inferior thyroid veins</td>
</tr>
<tr>
<td>inner cannula</td>
</tr>
<tr>
<td>cleaning</td>
</tr>
<tr>
<td>disadvantages</td>
</tr>
<tr>
<td>disposable</td>
</tr>
<tr>
<td>innominate (brachiocephalic) artery</td>
</tr>
<tr>
<td>innominate (brachiocephalic) vein,</td>
</tr>
<tr>
<td>left</td>
</tr>
<tr>
<td>intensive care</td>
</tr>
<tr>
<td>early days</td>
</tr>
<tr>
<td>Indications for tracheostomy</td>
</tr>
<tr>
<td>timing of tracheostomy</td>
</tr>
<tr>
<td>Intensive Care Society (ICS)</td>
</tr>
<tr>
<td>intensive care units (ICUs)</td>
</tr>
<tr>
<td>earlier discharge</td>
</tr>
<tr>
<td>performance of percutaneous tracheostomy</td>
</tr>
<tr>
<td>use of percutaneous tracheostomy</td>
</tr>
<tr>
<td>intensivists</td>
</tr>
<tr>
<td>emergency tracheostomy</td>
</tr>
<tr>
<td>percutaneous tracheostomy by</td>
</tr>
<tr>
<td>internal jugular vein</td>
</tr>
<tr>
<td>intracranial pressure (ICP)</td>
</tr>
<tr>
<td>intraoperative complications</td>
</tr>
<tr>
<td>ischaemic necrosis</td>
</tr>
<tr>
<td>Jackson, Chevalier</td>
</tr>
<tr>
<td>jugular arch</td>
</tr>
<tr>
<td>laryngeal incompetence</td>
</tr>
<tr>
<td>laryngeal mask airway (LMA)</td>
</tr>
<tr>
<td>laryngeal tumours</td>
</tr>
<tr>
<td>laryngoscopy, direct</td>
</tr>
<tr>
<td>levator glandulae thyroideae</td>
</tr>
<tr>
<td>lips, sore or ulcerated</td>
</tr>
<tr>
<td>local anaesthesia</td>
</tr>
<tr>
<td>lung collapse</td>
</tr>
<tr>
<td>magnetic resonance imaging (MRI)</td>
</tr>
<tr>
<td>malignancy, local</td>
</tr>
<tr>
<td>mediastinitis</td>
</tr>
<tr>
<td>medicolegal issues</td>
</tr>
<tr>
<td>Melker emergency</td>
</tr>
<tr>
<td>cricothyroidotomy kits</td>
</tr>
<tr>
<td>Minitrach Seldinger device</td>
</tr>
<tr>
<td>minitracheostomy</td>
</tr>
<tr>
<td>kits</td>
</tr>
<tr>
<td>techniques</td>
</tr>
<tr>
<td>mouth ulceration/soresness</td>
</tr>
<tr>
<td>mucolytic agents</td>
</tr>
<tr>
<td>mucus plugging</td>
</tr>
<tr>
<td>nasal erosions</td>
</tr>
<tr>
<td>nasogastric (NG) tube</td>
</tr>
<tr>
<td>nasotracheal intubation</td>
</tr>
<tr>
<td>neck</td>
</tr>
<tr>
<td>extension, avoiding extreme</td>
</tr>
<tr>
<td>flexion or extension, tracheal position</td>
</tr>
<tr>
<td>pre-procedure assessment</td>
</tr>
<tr>
<td>previous surgery</td>
</tr>
<tr>
<td>short, fat</td>
</tr>
<tr>
<td>needle</td>
</tr>
<tr>
<td>angulation</td>
</tr>
<tr>
<td>bronchoscope damage</td>
</tr>
<tr>
<td>entry/placement</td>
</tr>
<tr>
<td>bronchoscopic guidance</td>
</tr>
<tr>
<td>tips and tricks</td>
</tr>
<tr>
<td>green seeker</td>
</tr>
<tr>
<td>nerve supply</td>
</tr>
<tr>
<td>homunculus</td>
</tr>
<tr>
<td>trachea</td>
</tr>
<tr>
<td>nutrition, oral</td>
</tr>
<tr>
<td>obesity</td>
</tr>
<tr>
<td>morbid</td>
</tr>
<tr>
<td>oesophageal obturator devices</td>
</tr>
<tr>
<td>oesophagus</td>
</tr>
<tr>
<td>tears</td>
</tr>
</tbody>
</table>
omohyoid 15
open surgical tracheostomy see surgical tracheostomy, open operators experience 48, 71, 76, 85 training and accreditation 84–86 oral hygiene 35 oral nutrition 36 orotracheal intubation 35 oxygenation during bronchoscopy 89 before suctioning 125 before tube changes 127
paranasal sinus infections 35, 37 PEEP (positive end-expiratory pressure) 74, 89, 90 PercuQuick sequential dilator kit (Rüsch) 49, 50 technique of use 49–51 vs Blue Rhino kit 52 percutaneous tracheostomy (PcT) complications 41, 42, 44–45, 95–120 development 4–8 disadvantages 41–42 emergency 32–33 procedure see procedure, percutaneous tracheostomy repeat 138 techniques see techniques, percutaneous tracheostomy vs surgical tracheostomy 41–45 Percutrac kit 6, 7, 53–54 PercuTwist kit (Rüsch) 7, 49, 58 safety 44 technique of use 57–58 perioperative complications 45, 96 platelet count 72 platysma 15 pneumonia, nosocomial 116 pneumothorax 44, 106, 107–108 poliomyelitis 4 polyneuropathy, critical illness 26 Portex dilator kits 7, 50 Griggs technique see Griggs technique postoperative complications 44–45, 96 post-procedure care 121–129 pre-procedure care 71, 72 previous neck surgery 30, 31, 32, 138 procedure, percutaneous tracheostomy 71–86 accuracy of blind 88–89 anaesthesia 72–75 blunt dissection see blunt dissection bronchoscopic guidance see bronchoscopy, fiberoptic dilatation sequence 79, 90 documentation 86 equipment to aid 87–84 needle entry 78–80 passage of tube 81–82 pre-procedure care 71, 72 securing the tube 83, 84 skin incision see incision, skin surgical techniques 76–82 tips and tricks 131–137 training and accreditation 84–86 verification of tube placement 82–83 see also techniques, percutaneous tracheostomy Pro-Seal laryngeal mask airway (LMA) 73 psychological status 123 Rapitrach kit (Surgitech) 6, 52–53, 54 recurrent laryngeal nerve 12, 15, 19 Renaissance 3 repeat percutaneous tracheostomy 138 respiratory failure 23 resuscitation, tracheostomy patients 121–122 Rigveda 1 Rome, ancient 2
Index

Rüsch PercuQuick sequential dilator kit see PercuQuick sequential dilator kit
Sanctorius, Sanctorio 4–5
scar 42, 143
Schachner, A 6, 52
secretions, sputum 39–39
assessment of ability to clear 127–128
obstructive effects 118
suctioning see suctioning
Seldinger techniques
minitracheostomy 7, 59
percutaneous tracheostomy 5, 47, 49
semislaughter 3
sensory innervation 19, 21, 22
Shelden, CH 5
silver tracheostomy tubes 63, 64
skin erosion, nasal 25, 35, 38
skin incision see incision, skin
speaking aids 69–70
speech therapists 124
spine, anatomical distortions 11, 13
sputum retention 26–27
stents, tracheal 115, 116
sternal resection 139–140
sternocleidomastoid 15
sternohyoid 15
sternothyroid 15
sternotomy, median 32
stoma, tracheostomy care 126
depth measurement 81–82
difficulty in finding existing tract 138–139
granuloma formation 112, 113
healing 119, 128
infections see infections, stomal low 104, 131, 132
sitting 77, 104, 136
strap muscles 15
subclavian artery 12, 16, 17, 98
subglottic stenosis 24
suctioning 35, 124–125
blood clots 102–103
fenestrated tracheostomy tubes 67
synchronised cuff deflation 125
surgery, previous neck 30, 31, 32, 138
surgical referral, indications 142–143
surgical tracheostomy, open audit form 147
complications 42, 44–45, 97
vs percutaneous tracheostomy 22, 41–45
surgical wounds, adjacent 30, 32
swallowing ability, assessment 124, 149
techniques, percutaneous tracheostomy 47–61
comparisons between 48, 98
dilator-based 49–52
Fantoni see Fantoni translaryngeal method
forceps-based 52–55
kits available 49
usage of various kits 48, 49
see also procedure, percutaneous tracheostomy
thoracic spine, anatomical distortions 11, 13
thrombocytopenia 30, 32
thyroid cartilage 17
thyroid gland 12, 15, 17
isthmus 12, 15, 16
pre-procedure assessment 141
pyramidal lobe 16
thyroid ima artery 15, 16
thyroidectomy 12
tidal volume 89, 90
timing of tracheostomy 25–27
tips and tricks 131–143
Toye, FJ 5
trachea 11–20
anatomical relations 15–19
angulations 11, 13
Index

basic anatomy 12, 13
bleeding into 102
blood supply 15–19
innervation 19
needle entry see under needle
to skin fistula, long-term 119, 128
tracheal damage, perioperative 44, 95–97, 105–107
management 106
prevention strategies 106–107, 136–137
see also tracheal stenosis
tracheal diverticulum 13
tracheal stenosis 87–98, 109–116
diagnosis 109–110, 111
management 115–116
mechanisms of injury 112, 113
role of cuff pressure 114–115
timing of presentation 129
vs open tracheostomy 41, 42, 44, 111–112
trachealis muscle 11
tracheo-innominate vein/artery
fistula 103
tracheo-oesophageal fistula 116, 117
tracheostomy
contraindications 29–33
disadvantages 40
indications 21–23, 24
timing 25–27
vs translaryngeal intubation 21, 35–40
tracheostomy tubes 63–70
with adjustable flange 68–69, 135
changes 66, 126–127
choosing 69
cuffed 65–66
cuffs see cuffs, tracheostomy tube
custom-made 69
design features 63
dislodgement 97, 108–109
double lumen 66–68, 126
see also inner cannula
Fantoni method 57
fenestrated (speaking) 36–38, 64, 65–67, 70
incorrect placement 108
insertion 81–82, 134–135, 136
materials 63–64
narrowing 137, 138
obstruction 108–109, 121, 137
in percutaneous tracheostomy
kits 51, 64
removal see decannulation
securing 83, 84
speaking aids 69–70
too short 104–105
twist-lock 67
verification of correct placement 82–83
TRANCO® cleaning swab 68
training
aftercare 122
surgical procedure 84–86
transillumination, to guide needle
placement 78, 87, 132, 133
translaryngeal airway see
directlaryngeal (ET) tube
directlaryngeal (endotracheal; ET)
intubation 35–40
complications of prolonged 23, 24, 25, 26, 35, 38
disadvantages 39
facilitation of extubation 23, 26, 38
tracheal stenosis 111, 112
vs tracheostomy 21, 35–40
translaryngeal method see Fantoni
translaryngeal method
T-tube stent, tracheal 115, 116
tubes, tracheostomy see
tracheostomy tubes
twist-lock locking system 67
Tyco Fantoni translaryngeal kit 49
ultrasound imaging 91–93
equipment 18, 93
midline vascular anatomy 18–19
pre-procedure 30, 31, 92–93, 100, 141
| vagus nerve    | 12, 15, 19                     | weaning see weaning, ventilator |
| valves, speaking | 70                          | vibrational speaking aids 70   |
| veins, neck    | 98, 99                       | wards, general                |
| anatomy        | 12, 15, 16, 18, 98, 99       | indications for tracheostomy  |
| damage         | 100                          | 22–23                        |
| pre-procedure assessment | 76, 92, 141 | tracheostomy care 118, 121, 122 |
| ventilation, assisted |                        | Washington, George 3–4       |
| during bronchoscopic guidance | 89–91                 | weaning                      |
| indications for prolonged | 24, 26                  | failure 137                  |
| succioning and | 125                          | ventilator 23, 26, 27        |
| tracheostomy patients | 121–122             | Weinstein, JD 5              |
| work of breathing | 38                         |