CONSORCI HOSPITAL GENERAL UNIVERSITARI VALÈNCIA

CONSORCIO HOSPITAL GENERAL UNIVERSITARIO DE VALENCIA — SERVICIO DE ANESTESIOLOGIA, REANIMACION Y TERAPEUTICA DEL DOLOR

ANESTESIA PEDIÁTRICA

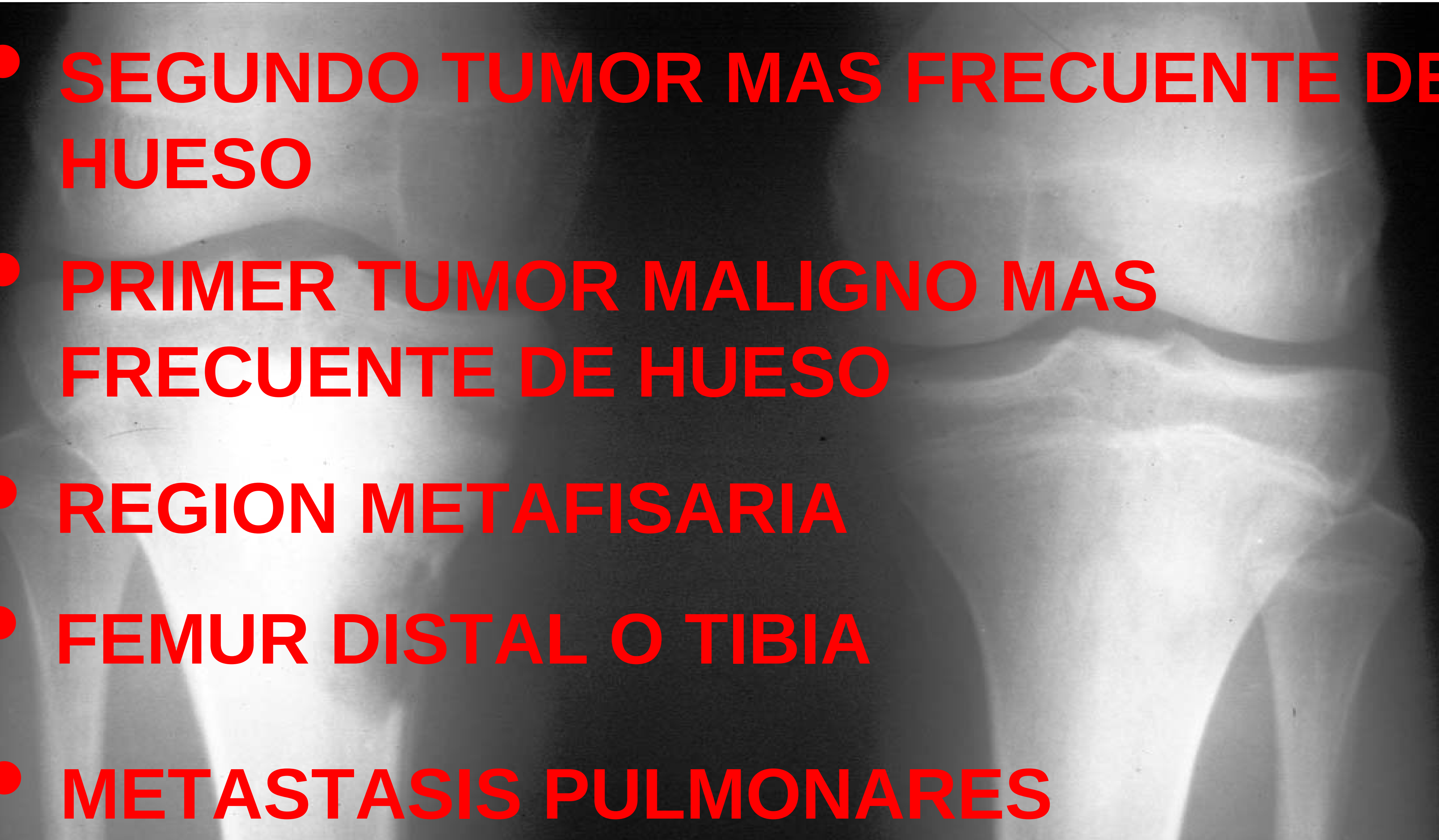
MANEJO DEL OSTEOSARCOMA

Dra. María Garví
Dr. Miguel Plaza

Servicio de Anestesia Reanimación y Tratamiento del Dolor
Consorcio Hospital General Universitario
Valencia

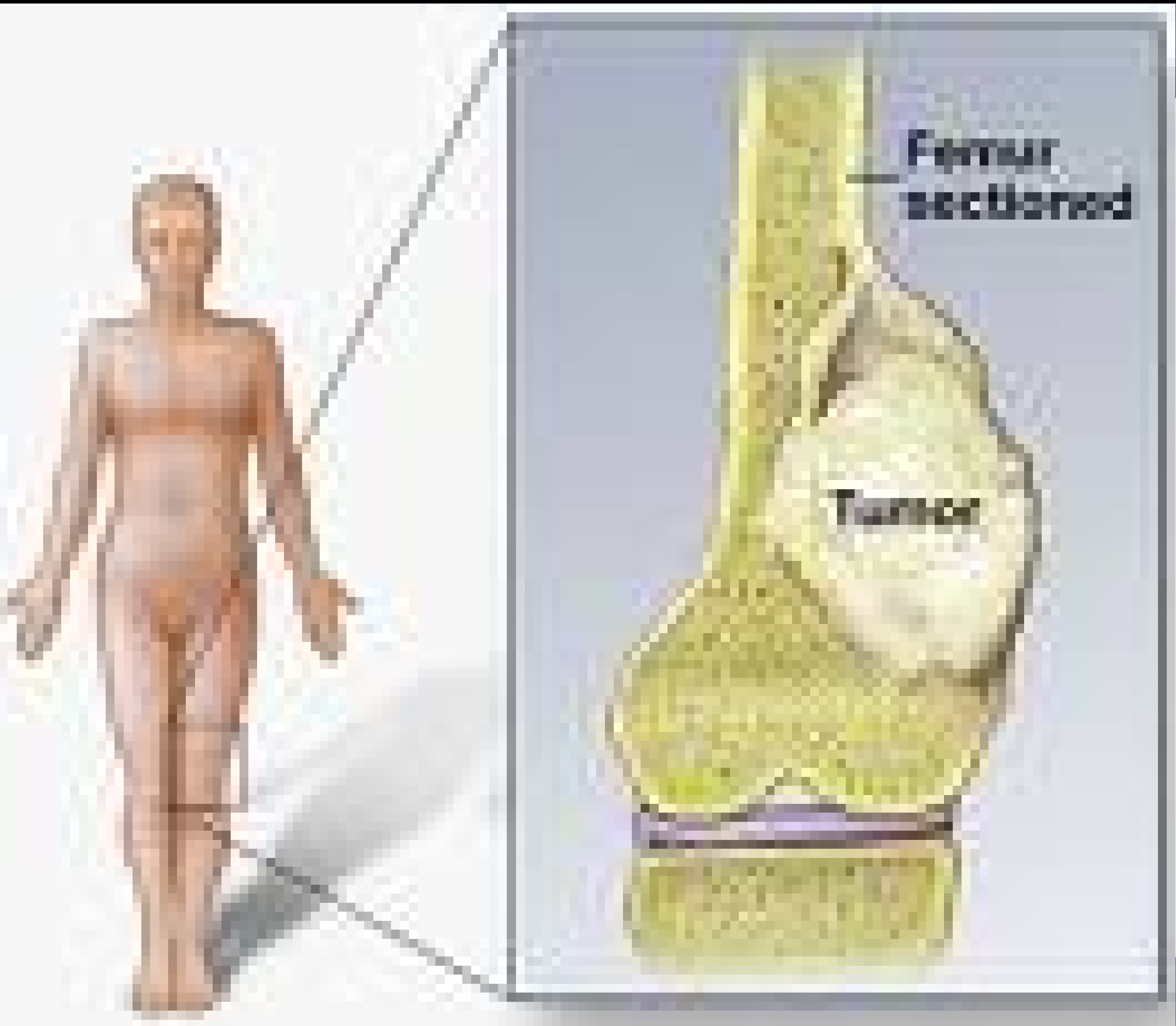
- Paciente de 8 años, 29 kg de peso, con antecedentes de ostosarcoma con metástasis pulmonares. Tratamiento actual con quimioterapia, que ingresa de forma programada para reserción de la lesión tibial. En el preoperatorio, apertura limitada de boca, Mallampati IV, limitación de la extensión cervical y antecedentes de venopunción difícil debido a la quimio por lo que se implanta reservorio.

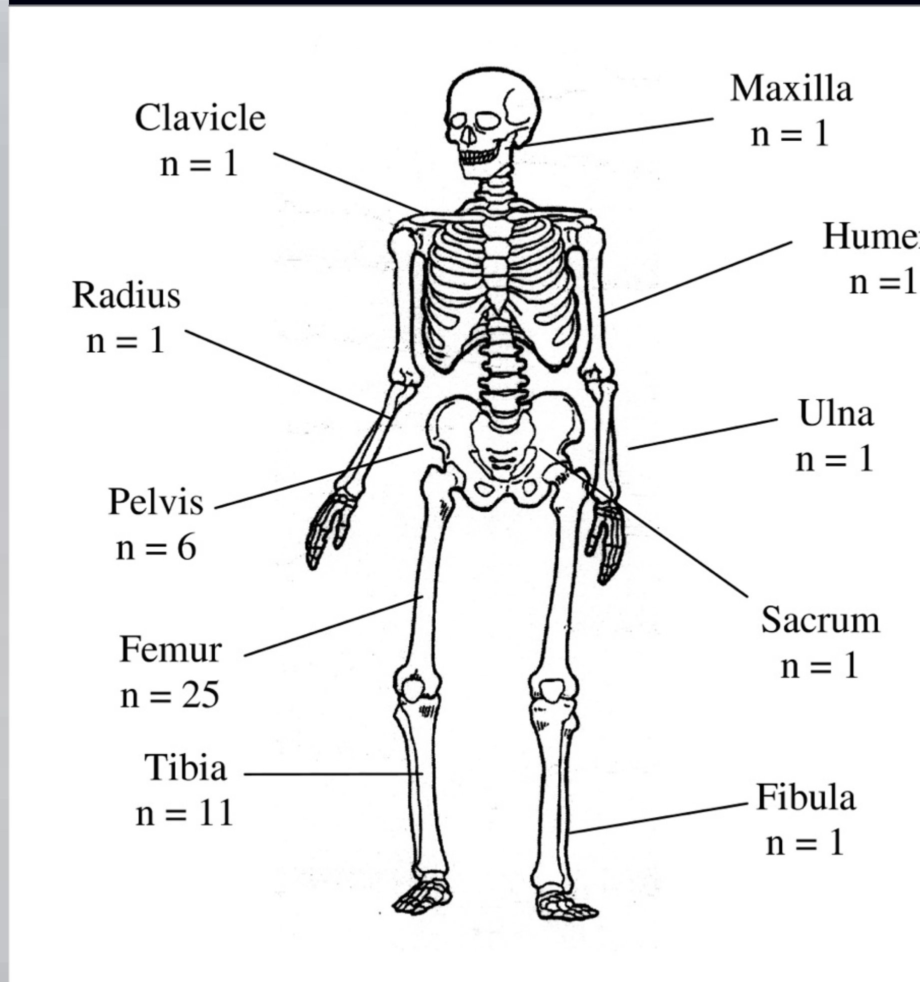
CARACTERISTICAS



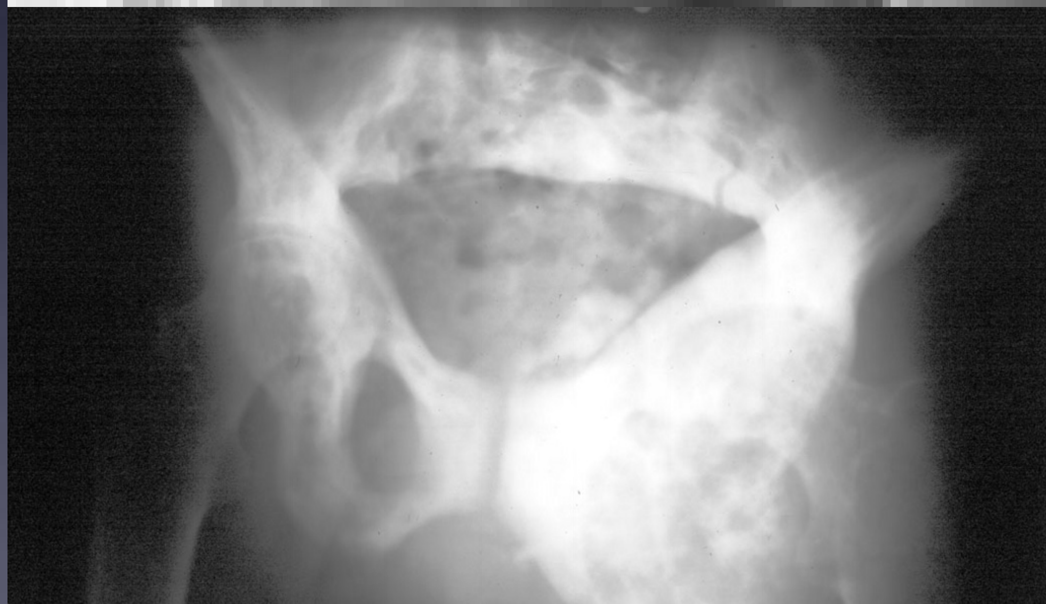
- SEGUNDO TUMOR MAS FRECUENTE DE HUESO
- PRIMER TUMOR MALIGNO MAS FRECUENTE DE HUESO
- REGION METAFISARIA
- FEMUR DISTAL O TIBIA
- METASTASIS PULMONARES

CARACTERISTICAS





CARACTERISTICAS



Manejo Médico

- Pronostico relacionado con respuesta a quimio.

- Quimio prequirurg:

Doxorrubicina
Cisplatino
Methotrexate
Ifosfamida

- Mejor pronostico combinado con cirugía

- Radioterapia y Quimio postop segun histologia de bordes

Cisplatino
Adriamicina

- Tratamiento psicologico

Radiation Therapy

Radiation therapy uses high-energy rays or particles to kill cancer cells. **External beam radiation therapy** uses radiation delivered from outside the body that is focused on the cancer. This is the type of radiation therapy that has been tried as a treatment for osteosarcoma.

However, osteosarcoma cells are not easily killed by radiation. Radiation therapy does not play a major role in treating this disease. Studies have found that radiation in addition to surgery in osteosarcoma patients with lung metastasis did not improve their survival.

Radiation therapy may be useful, however, in some cases where the tumor cannot be completely removed by surgery. For example, osteosarcoma can develop in pelvic bones or in the bones of the face -- particularly the jaw. In these situations, it is often not possible to completely remove the cancer. As much as possible will be removed then radiation will be giver to kill the remaining cancer. It is also helpful in controlling local symptoms like pain and swelling if the cancer has come back or surgery is not possible.

Bone-seeking radioactive chemicals are sometimes used to treat osteosarcoma. **Samarium-153** may be given in addition to external beam radiation therapy. It is injected intravenously and attaches to active areas of bone formation such as in osteosarcomas. There are no side effects from the injection. It is also useful in treating advanced disease and is particularly helpful in

Cho WH, Lee SY, Song WS, Park JH.

Department of Orthopaedic Surgery, Korea Cancer Centre Hospital, Nowon-gu, Seoul, Korea.

Bone primary sarcomas undergone unplanned intralesional procedures - the possibility of limb salvage and their oncologic results.

Jeon DG, Lee SY, Kim JW.

Department of Orthopaedic Surgery, Korea Cancer Center Hospital, 215-4 Gongneung-Dong, Nowon-Gu, Seoul, Korea. dgjeon@kcch.re.kr

Treatment and prognosis for synchronous multifocal osteosarcoma in 42 patients.

Bacci G, Fabbri N, Balladelli A, Forni C, Palmerini E, Picci P.

Department of Musculoskeletal Oncology, Istituti Ortopedici Rizzoli, Via Pupilli 1, 40136 Bologna, Italy. gaetano.bacci@ior.it

Primary bone osteosarcoma in the pediatric age: state of the art.

Longhi A, Errani C, De Paolis M, Mercuri M, Bacci G.

The usual sequence of treatment for patients with metastasis at diagnosis is as follows:

- Biopsy of primary tumor and metastasis to establish the diagnosis
- Chemotherapy (usually for 10 weeks). If metastases are not resectable, more chemotherapy
- Surgery to remove the primary tumor and all of the metastases if possible
- More chemotherapy (for approximately one year)

Treatment of Localized Osteosarcoma That Can Be Completely Removed With Surgery

The usual sequence of treatment for patients without metastasis at diagnosi cancers can be completely removed by surgery is as follows:

- Biopsy to establish the diagnosis
- Chemotherapy (usually for 10 weeks)*
- Surgery
- More chemotherapy (for approximately one year)*

Treatment of Localized Osteosarcoma That Can Not Be Completely Removed With Surgery

The usual sequence of treatment for non-resectable tumors is as follows:

- Biopsy to establish the diagnosis
- Chemotherapy for approximately one year
- Radiation therapy may be added

Chemotherapy

Ifosfamide and **cyclophosphamide** may cause hemorrhagic cystitis (bladder inflammation and blood in the urine) and damage to the kidney, with loss of salt and minerals in the urine. After ifosfamide or cyclophosphamide, a drug called mesna will be given to protect the bladder.

Cisplatin may produce severe and delayed nausea, problems with hearing loss (especially high pitched sounds) or even deafness, and kidney damage. It can also cause nerve damage, which is mainly felt as numbness and tingling of the arms and legs.

High-dose methotrexate may cause liver damage, sores in the mouth and digestive tract, leukoencephalopathy (damage to the white matter of the brain), and reversible kidney damage. Before starting high-dose methotrexate, a bicarbonate solution will be added to the intravenous (IV) fluids to keep the urine alkaline (a ph of 7 or above). Methotrexate blood levels may be checked to see how much folinic acid (also called leucovorin) should be given to stop any damage to normal tissues. The folinic acid will be continued until the methotrexate level is safe.

Doxorubicin (Adriamycin) may cause heart damage and may also induce second cancers. If the drug leaks from the vein into the surrounding tissues, skin burns may occur.

doxorubicin and cisplatin. Other combinations are dactinomycin, bleomycin and cyclophosphamide, or ifosfamide and etoposide.

Psychosocial Considerations in Treatment of Osteosarcoma

Most cases of osteosarcoma develop during the teenage years – a very sensitive time in a child's life. A diagnosis of osteosarcoma has a great effect on a person's ability to continue certain school, work, or recreational activities. The effect will be greatest during the first year treatment. The treating center should evaluate the person's family situation as soon as possi so that any areas of concern can be addressed.

Some common concerns include financial stress, transportation to the cancer center, loss of job, and homebound teaching. Cancer care teams usually recommend that school-age child attend school as much as possible. This way, they have the opportunity to tell their friends w is happening to them.

Friends may become a great source of support, but you should be aware that some people have a lot of misunderstanding and fears about cancer. Some cancer centers have a school entry program that can help in situations like this. With this program, health educators go to school and offer information about the diagnosis, treatment, and changes the person will experience. They will also answer any questions from teachers and classmates.

Manejo Quirúrgico.

- Limb-salvage surgery

- Amputación miembro

- Excisión masa tumoral

emicortical excision for low-grade selected surface arcomas of bone.

garwal M, Puri A, Anchan C, Shah M, Jambhekar N.

epartment of Surgery, Tata Memorial Hospital, Mumbai, India.
gagarwal@gmail.com

Bone primary sarcomas undergone unplanned intralesional procedures - the possibility of limb salvage and their oncologic results.

Jeon DG, Lee SY, Kim JW.

Department of Orthopaedic Surgery, Korea Cancer Center Hospital, 215-4 Gongneung-Dong, Nowon-Gu, Seoul, Korea. dgjeon@kcch.re.kr

Treatment results of pediatric osteosarcoma: twenty-year experience.

Varan A, Yazici N, Aksoy C, Gedikoğlu G, Yalçin B, Akyüz C, Kutluk T, Büyükpamukçu M.

Department of Pediatric Oncology, Institute of Oncology, Hacettepe University, Ankara, Turkey. hupog@tr.net

Clinical outcome of osteosarcoma with primary total femoral resection.

Jeon DG, Kim MS, Cho WH, Song WS, Lee SY.

Department of Orthopaedic Surgery, Korea Cancer Center Hospital, Seoul, Korea

surgery is called rotationplasty. Of course, the patient will need a prosthetic device to extend the leg.

Amputation: Amputation may be the only option for some patients. If the patient has a large tumor that extends into the nerves and/or the blood vessels, it may not be possible to save the limb. MRI scans before surgery and examination of the tissue by the pathologist at the time of surgery can help the surgeon decide how much of the arm or leg needs to be amputated. Surgery is planned so that muscles and the skin will form a cuff around the amputated bone. This cuff will fit into the end of a prosthetic (artificial) limb. With proper physical therapy the patient is often walking on his/her own 3 to 6 months after leg amputation.

Surgery for osteosarcoma includes the diagnostic biopsy and the surgical treatment. It is very important that the biopsy and surgical treatment be planned together. If possible, the same orthopedic surgeon at a cancer center should do both the biopsy and the surgical treatment. Some osteosarcomas are localized but, because of its location (for example, at the base of the skull, or in the spine or pelvis), cannot be removed surgically after chemotherapy. In these cases, a cure is very unlikely even if the cancer responds well to chemotherapy.

Limb-salvage surgery: Anywhere from 50% to 80% of patients are eligible to have limb-salvage surgery. Limb-salvage surgery is a very complex operation. The surgeons performing this type of operation must have special skills and experience. The challenge for the surgeon is to remove the entire tumor while still preserving the nearby tendons, nerves, and blood vessels. The bone that is removed is replaced with a bone graft or with an endoprosthesis (meaning internal prosthesis) made of metal and other materials. Endoprostheses (an artificial bone replacement within the body) have become very sophisticated. Because they are often implanted in growing children, they are designed to allow lengthening as the child grows. In many instances, this requires additional surgeries. However, new endoprosthesis exist that can

Manejo Anestésico

1.- Visita preanestésica

2.- Adecuación y premedicación

3.- Inducción anestésica

4.- Mantenimiento

5.- Anestesia locorregional

6.- Despertar

7.- Analgesia postoperatoria

Manejo Anestésico

- Neostigmina 0.05-0.07mg/kg/ev + atropina 0.01mg/kg/ev
- Extubación: dormido o despierto?
- Laringoespasmo:

  -ventilar con O2 100%

  -considerar succinilcolina 0.1-0.5mg/kg/ev y ventilar a presión positiva

  -valorar reintubación si hipoxemia no cede.
- Estrategias para disminuir el delirium de la emergencia con sevoflurane: propofol, fentanilo, midazolam, clonidina

Manejo Anestésico

- **NAUSEAS Y VOMITOS**

Evaluation of postoperative general quality of life for patients with osteosarcoma around the knee joint.

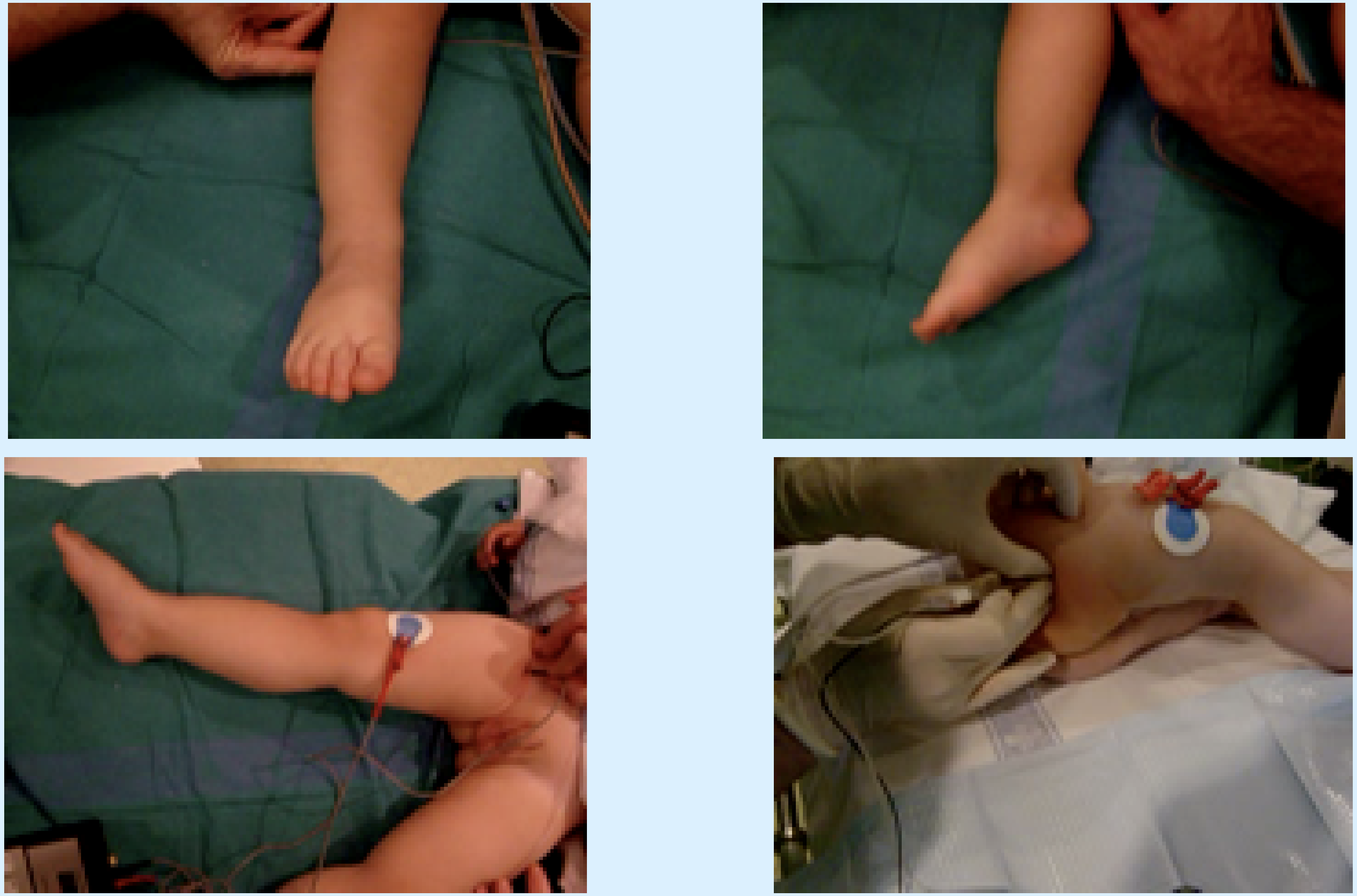
Akahane T, Shimizu T, Isobe K, Yoshimura Y, Fujioka F, Kato H.

Department of Orthopaedic Surgery, Shinshu University School of Medicine, Matsumoto, Nagano, Japan. akahane@hsp.md.shinshu-u.ac.jp

- Ondansetron: 0.1mg/kg/ev

Manejo Anestésico

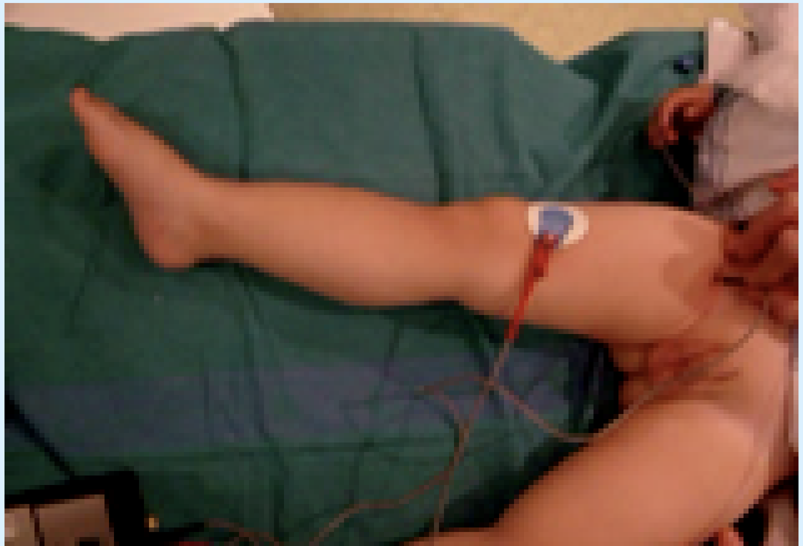
BLOQUEOS E. INFERIOR



Manejo Anestésico

BLOQUEOS E. INFERIOR






Manejo Anestésico

ANESTESIA EPIDURAL

- Lumbar:
  - distancia al espacio peridural: 1mm/kg entre 6m-10años
  - dosis test: bupivacaína adrenalina 1:1000 0.1-0.2ml/kg
  - dosis 0.5ml/kg para abdomen inferior y 1ml/kg para abdomen superior o torácico bajo
- Perfusiones a 1/3 o 1/2 de la dosis inicial cada hora (vigilar dosis tóxicas!)

Manejo Anestésico

BLOQUEO CAUDAL

Caudal:

- 0.5ml/kg para EEII,
- 0.75ml/kg para nivel inguinal,
- 1ml/kg para abdomen,
- 1.25ml/kg para nivel torácico bajo

Manejo Anestésico

EXPANSORES

- Gelatinas
- Hidroxietilalmidones (voluven®)

- Hematíes: 10ml/kg
- Donación preoperatoria de sangre autóloga
- Hemodilución aguda normovolémica

Manejo Anestésico

TRANSFUSIONES

	VSC
Prematuro	90-100ml/kg
Lactante a término	80-90ml/kg
3m-1a	70-80ml/kg
>1a	70ml/kg

$$PMA = VSC \times \frac{\text{hto inicial} - \text{hto mínimo}}{\text{hto inicial}}$$

Manejo Anestésico

- 1ª hora: 2-4ml/kg por hora de ayuno previo
- después:
  - Mantenimiento, diuresis, sangrado,
  - agresión quirúrgica: menor 2-4ml/kg/h, moderada 5-7ml/kg/h, severa

Manejo Anestésico

Peso (kg)	ml/kg
< 10kg	4ml
10 a 20kg	40ml + 2ml por cada kg en exceso de 10kg
>20kg	60ml + 1ml por cada kg en exceso de 20kg

Manejo Anestésico

- Rocuronio: 0.6mg/kg/30min
- Cisatracurio: 0.1mg/kg/30min
- Vecuronio: 0.01mg/kg/25-30min
- Atracurio: 0.4mg/kg/30min
- Mivacurio: 0.1mg/kg/6-10min.

Manejo Anestésico

- Anestesia inhalatoria:
  - 30-100% O2 + 0-70% N2O
  - sevoflurano, isoflurano, halotano a concentraciones según efecto
  - calentar y humidificar los gases
- Anestesia balanceada:
  - 30-100% O2 + 0-70% N2O
  - isoflurano 0.5% o propofol
  - fentanilo 1-3mcg/kg/h hasta 10-20mcg/kg/h
  - Cl.mórfico 0.05mg/kg/h

VÍA AÉREA PEDIÁTRICA

- Anatomía

- Evaluación

- Manejo

VÍA AÉREA PEDIÁTRICA

- Anatomía

- Evaluación

- Manejo

VÍA AÉREA PEDIÁTRICA

- Anatomía
- Evaluación
- Manejo

ANATOMIA

- LARIGE MÁS ALTA QUE EN ADULTOS C3-C4
- FÁCIL OBSTRUCCIÓN POR LA LENGUA
- EPIGLOTIS MÁS DIFÍCIL DE ELEVAR
- RESPIRACIÓN NASAL OBLIGADA HASTA 5º MES

ANATOMIA

Preparation of the patient and technique

Positioning

Placement of a small cushion under the heads of older children in order to facilitate positioning of the axes (Figure 3).

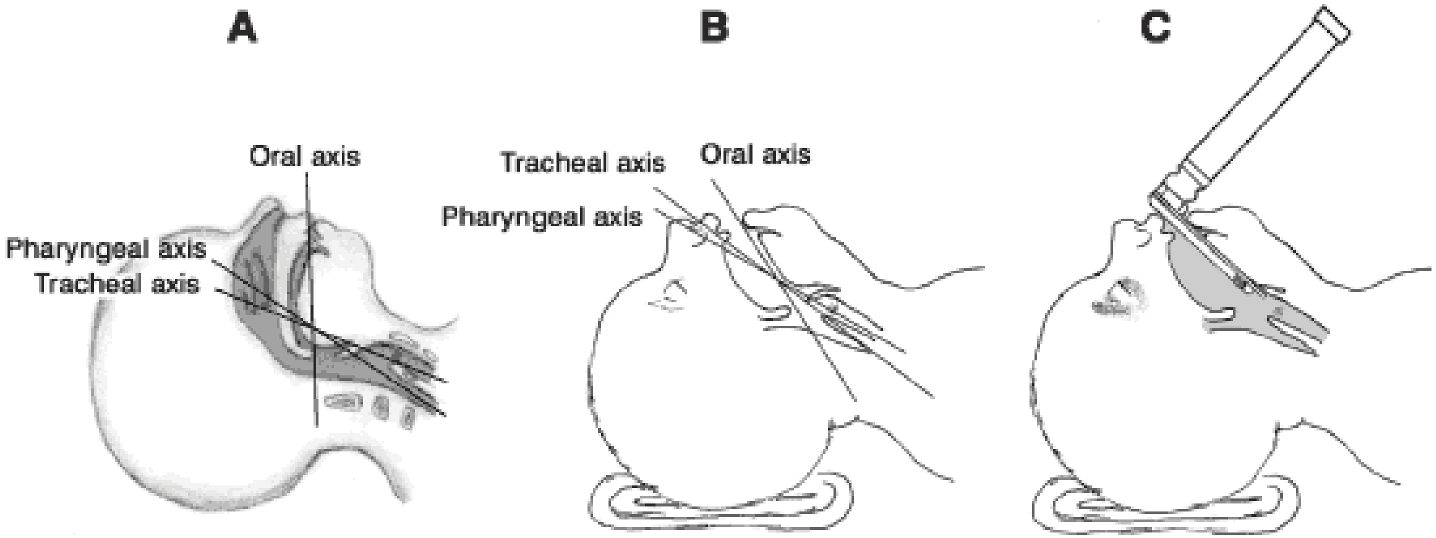


Figure 3 - A) Illustration of the axes (oral, pharyngeal and tracheal); B) alignment of these axes with correct positioning; C) viewing the glottic fold with a straight blade

With newborn infants, the cushion under the head is often unnecessary because of the large size of the head, proportionally, where the occiput already raises the level of the head. In these cases, a cushion may be used under the neck and shoulder blades to stabilize the head position.

ANATOMÍA

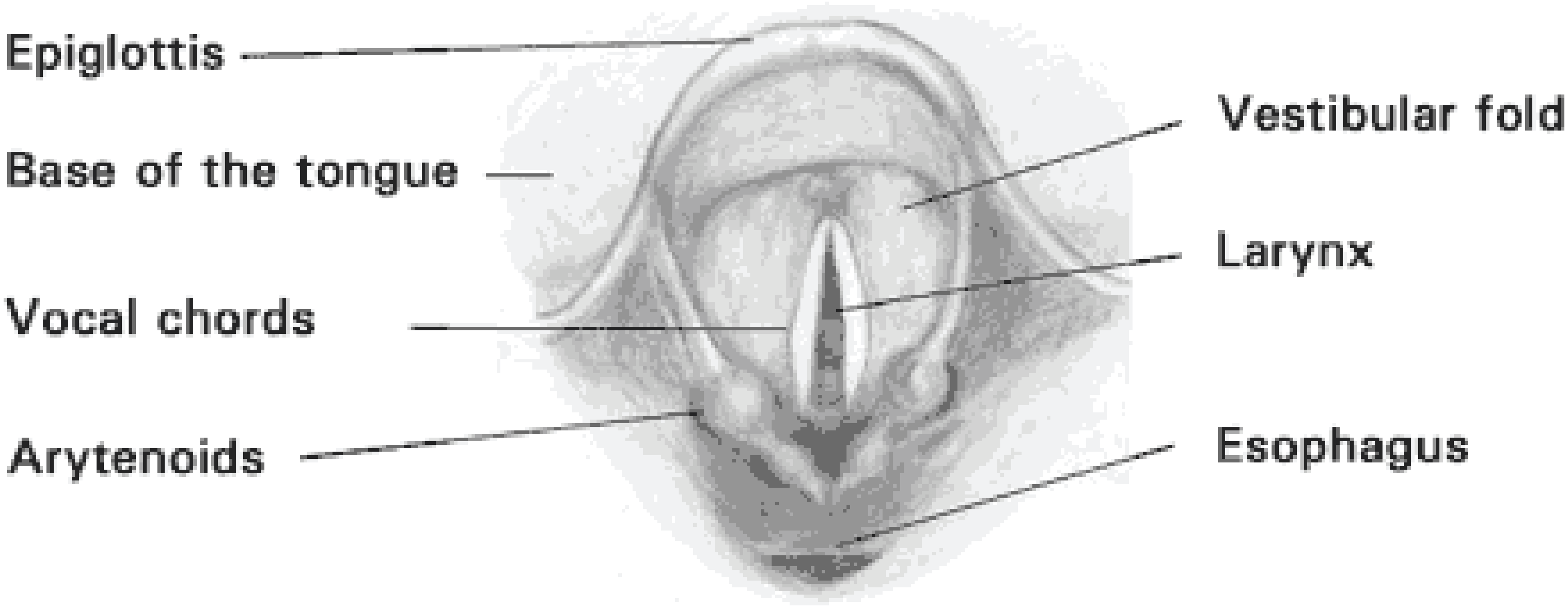


Figure 1 - View of the glottic area via direct laryngoscopy

EVALUACIÓN VÍA AÉREA

- PNEUMONIAS DE REPETICIÓN
- EXAMEN FÍSICO APERTURA DE BOCA FRECUENCIA RESPIRATORIA
- ATOPIA O ALERGIA
- ASPIRACIÓN CUERPO EXTRAÑO
- RESPIRACIÓN SONORA RONQUIDO
- PRESENCIA DE TOS
- EPISODIOS DE CROUP ESTRIDOR
- ASMA O TERAPIA BRONCODILATARORA

EVALUACIÓN VÍA AÉREA

ble 1. Components of the Preoperative Airway Physical Examination

Airway Examination Component	Nonreassuring Findings
. Length of upper incisors	Relatively long
. Relation of maxillary and mandibular incisors during normal jaw closure	Prominent "overbite" (maxillary incisors anterior to mandi incisors)
. Relation of maxillary and mandibular incisors during voluntary protrusion of cannot bring	Patient mandibular incisors anterior to (in mandible front c maxillary incisors
. Interincisor distance	Less than 3 cm
. Visibility of uvula	Not visible when tongue is protruded with patient in sittin position (*e.g.*, Mallampati class greater than II)
. Shape of palate	Highly arched or very narrow
. Compliance of mandibular space	Stiff, indurated, occupied by mass, or nonresilient
. Thyromental distance	Less than three ordinary finger breadths
. Length of neck	Short
). Thickness of neck	Thick
. Range of motion of head and neck	Patient cannot touch tip of chin to chest or cannot extenc

MANEJO VÍA AÉREA

- MASCARILLAS FACIALES
- TUBOS GUEDEL
- MASCARILLAS LARÍNGEAS
- PALAS LARINGOSCOPIO
- TUBOS ENDOTRAQUEALES

MANEJO VÍA AÉREA

New formulae for predicting tracheal tube length.

Lau N, Playfor SD, Rashid A, Dhanarass M.

University of Manchester Medical School, Manchester, UK.

BACKGROUND: The aim of this study was to determine the accuracy of standard techniques for estimating oral and nasal tracheal tube length in children and to devise more accurate predictive formulae that can be used at the bedside. METHODS: Data w collected from 255 children who required tracheal intubation whilst on the Pediatric Intensive Care Unit over a period of 1 year. Age, weight, the final length of the trache tube and the internal diameter were documented. Patients with a tracheostomy were excluded from the study. RESULTS: Using linear regression the following formulae bes predicted final tracheal tube length. For children over 1 year of age: Insertion depth (for orotracheal intubation = age/2 + 13 Insertion depth (cm) for nasotracheal intubati = age/2 + 15 For children below 1 year of age: Insertion depth of orotracheal tube (c = weight/2 + 8 Insertion depth of nasotracheal tube (cm) = weight/2 + 9 CONCLUSIO Current Advanced Paediatric Life Support guidelines underestimate the appropriate tracheal tube lengths for orotracheal intubation in children over 1 year of age. Similar the novel weight-based formulae for tracheal tube lengths in children below the age o year proved more accurate than standard reference charts. We therefore recommend these new formulae are prospectively evaluated.

MANEJO VÍA AÉREA

How reliable is length-based determination of body weight and tracheal tube size in the paediatric age group? The Broselow tape reconsidered.

Hofer CK, Ganter M, Tucci M, Klaghofer R, Zollinger A.

Institute of Anaesthesiology, Triemli City Hospital, Zürich, Switzerland.

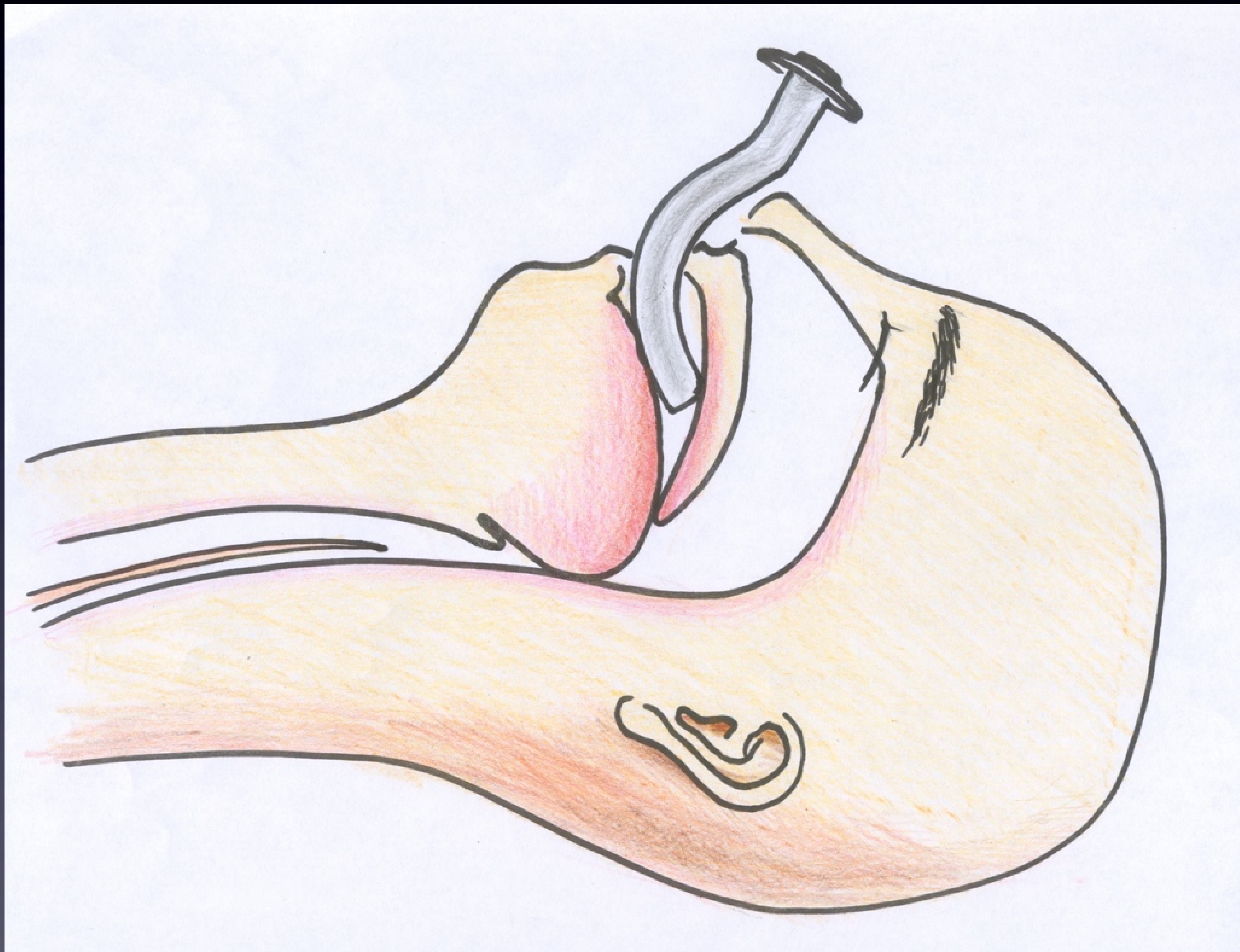
BACKGROUND: The Broselow tape was designed to estimate body weight and tracheal tube size on the basis of the body length of emergency paediatric patients. The tape was validated previously in US populations. We assessed its accuracy in a sample of European children by reviewing paediatric anaesthetic charts at the Triemli City Hospital for 1999. METHODS: Age, body length and body weight measured before surgery as well as the size of the tracheal tube used were recorded. The body weight was estimated on the basis of body length using the Broselow tape and was compared with the measured weight. Tracheal tube size selections using the Broselow tape and an age-based formula were compared with the size of the tube used. RESULTS: A good correlation was found between the Broselow weight and the measured weight (r2=0.88). Bland-Altman analysis revealed a mean bias of -0.52 kg for the entire study population. For children < or = 20 kg the mean bias was -0.05 kg, and for children > 20 kg was -1.05 kg. The Broselow weight was found to be within a 10% error of the measured weight in 65% of children. Tracheal tube selection by the Broselow tape method was adequate in 55% but underestimated the actual tube size in 39%. The age-based formula matched the actual tracheal tube size in 41% of children but overestimated it in 57%. CONCLUSIONS: The Broselow tape is an accurate means to assess body weight from length in smaller children; in older children it underestimated body weight. Endotracheal tube size selection by the Broselow tape appears to match the size of the tube used better than the age-based formula. The results

MANEJO VÍA AÉREA

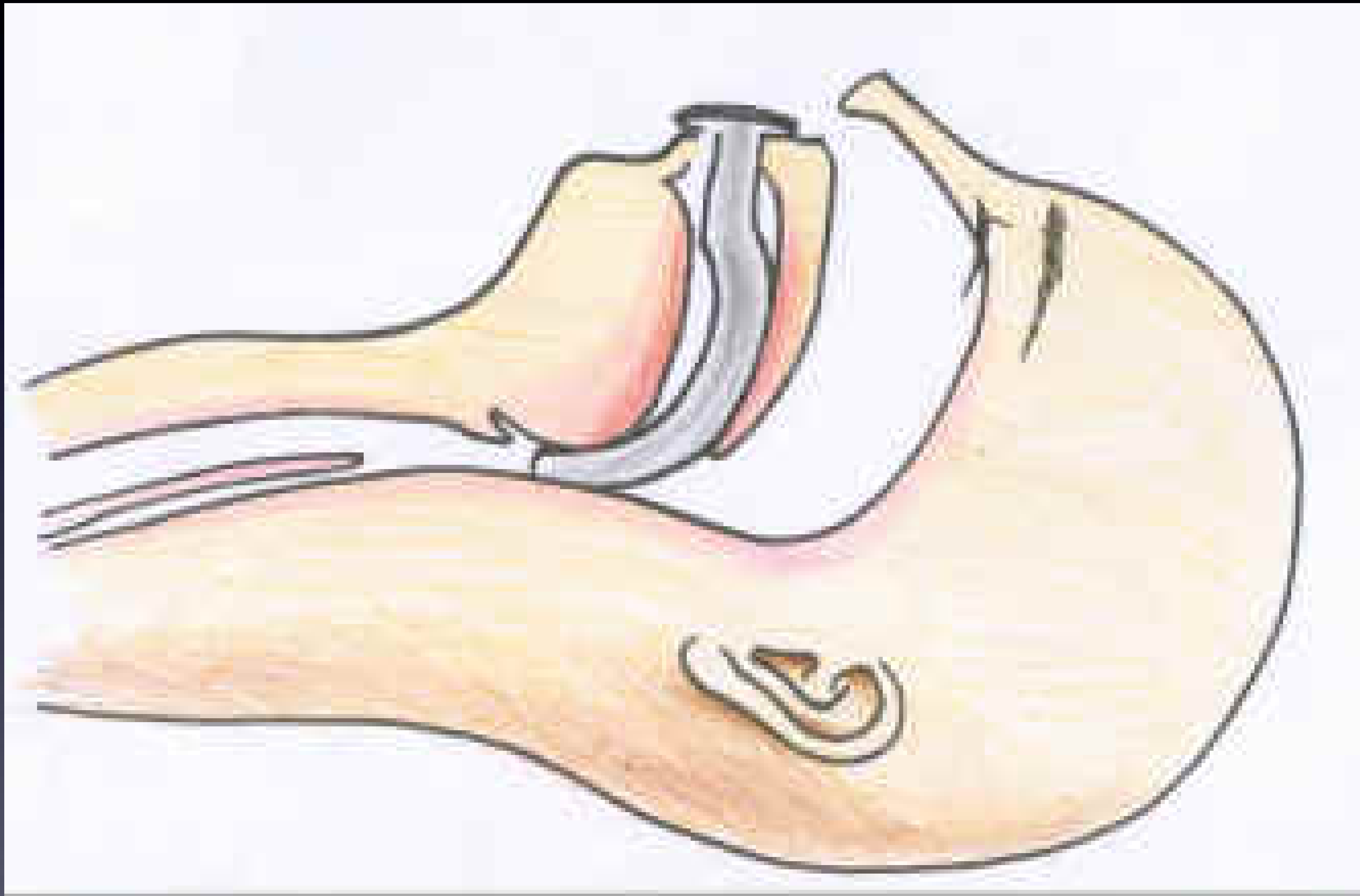
MANEJO VÍA AÉREA

MANEJO VÍA AÉREA

MANEJO VÍA AÉREA



MANEJO VÍA AÉREA



MANEJO VÍA AÉREA

10. Tubos endotraqueales

Edad	Peso	Diámetro interno Tubo
Prematuros		0.5 + e.gestacional (sem)/10
Neonato	3-4kg	3.0
<6-8 meses	6-8kg	3.5
8-16 meses	10-12kg	4.0
2-3 años	13-15kg	tamaño del Tubo= 4+ (edad años/4)
6 años	20kg	
9 años	30kg	
12 años	40kg	

MANEJO VÍA AÉREA

MANEJO VÍA AÉREA

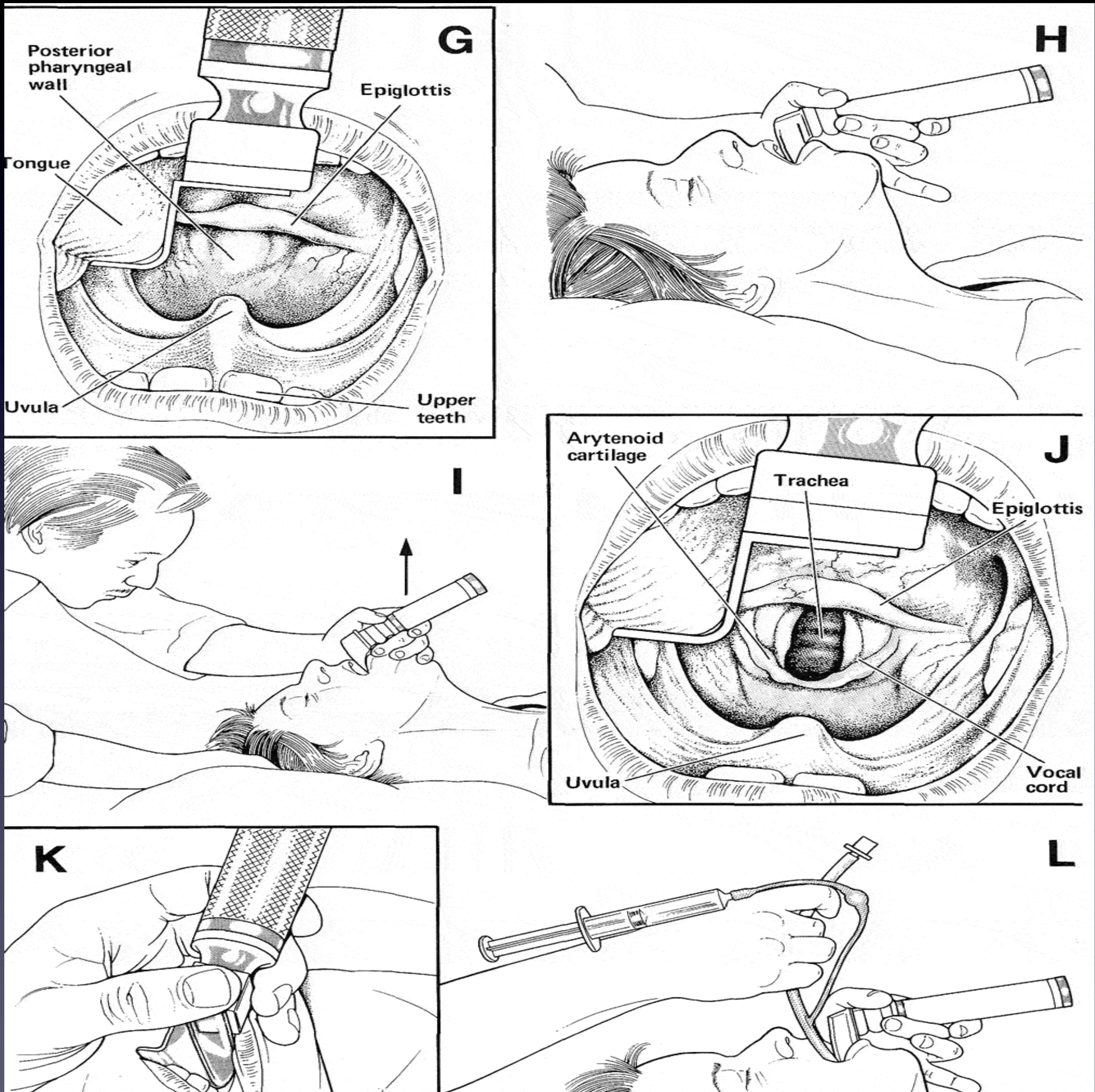
MANEJO VÍA AÉREA

9. Laringoscopios

pala	Edad
Miller 0	Neonatos
Miller 1	6-9 meses
Macintosh 1	Neonatos
Macintosh 2	1-4 años
Macintosh 3 o Miller 2	› 4 años

MANEJO VÍA AÉREA

MANEJO VÍA AÉREA



MANEJO VÍA AÉREA

Edad, peso	N° ML	Volúmen cuff	TET Ø	FBCØ(mm)
Neonato-5kg	1	4ml	3	1.8
			3.5	2.7
5-10kg	1.5	7ml	4	3
10-20kg	2	10ml	4.5	3.5
20-30kg	2.5	14ml	5	4
>30kg	3	20ml	6	5
"Adulto"	4	30ml	6	5
	5	40ml	7	7.3

MANEJO VÍA AÉREA

No muscle relaxants required

Smooth emergence from anaesthesia

Minimal haemodynamic response

A secure, hands-free airway

Latex free

Size	1	1 1/2	2	2 1/2	3	4	5	6
Patient Selection Information	Neonate <5kg	Infant 5-10kg	Child 10-20kg	Child 20-30kg	Child 30-50kg	Adult 50-70kg	Adult 70-100kg	Adult >100kg
Maximum Inflation Volume	4ml	7ml	10ml	14ml	20ml	30ml	40ml	50ml
Part Number	7110	7115	7120	7125	7130	7140	7150	7160

Laryngeal mask airway sizes to suit body weight (kg) of newborns, infants and children are: size 1 <5kg; size $1\frac{1}{2}$ 5-10kg; size 2 10-20kg; size $2\frac{1}{2}$ 20-30kg; size 3 30-50kg; size 4 50-

MANEJO VIA AEREA DIFICIL

Table 3. Techniques for Difficult Airway Management

Techniques for Difficult Intubation	Techniques for Difficult Ventilation
Alternative laryngoscope blades	Esophageal tracheal Combitube
Awake intubation	Intratracheal jet stylet
Blind intubation (oral or nasal)	Laryngeal mask airway
Fiberoptic intubation	Oral and nasopharyngeal airways
Intubating stylet or tube changer	Rigid ventilating bronchoscope
Laryngeal mask airway as an intubating conduit	Invasive airway access
Light wand	Transtracheal jet ventilation
Retrograde intubation	Two-person mask ventilation
Invasive airway access	

MANEJO VIA AEREA DIFICIL

AMERICAN SOCIETY OF ANESTHESIOLOGISTS

DIFFICULT AIRWAY ALGORITHM

. Assess the likelihood and clinical impact of basic management problems:

A. Difficult Ventilation
B. Difficult Intubation
C. Difficulty with Patient Cooperation or Consent
D. Difficult Tracheostomy

. Actively pursue opportunities to deliver supplemental oxygen throughout the process of difficult airway manage

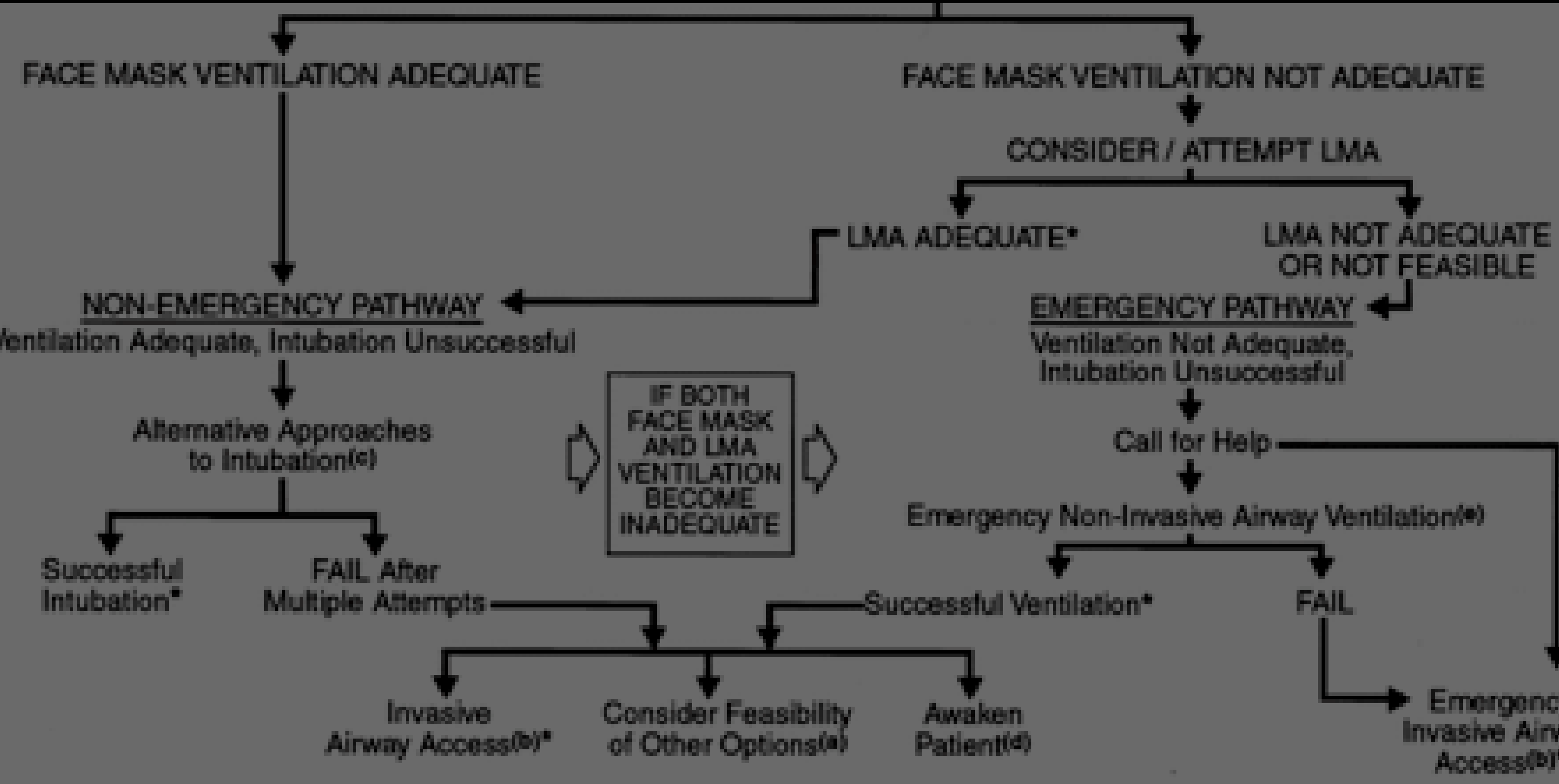
. Consider the relative merits and feasibility of basic management choices:

A. Awake Intubation -vs.- Intubation Attempts After Induction of General Anesthesia

B. Non-Invasive Technique for Initial Approach to Intubation -vs.- Invasive Technique for Initial Approach to Intubation

C. Preservation of Spontaneous Ventilation -vs.- Ablation of Spontaneous Ventilation

MANEJO VIA AEREA DIFICIL



MANEJO VIA AEREA DIFICIL

rm ventilation, tracheal intubation, or LMA placement with exhaled CO_2

er options include (but are not limited to): surgery utilizing face
k or LMA anesthesia, local anesthesia infiltration or regional
e blockade. Pursuit of these options usually implies that mask
ilation will not be problematic. Therefore, these options may be
nited value if this step in the algorithm has been reached via
Emergency Pathway.

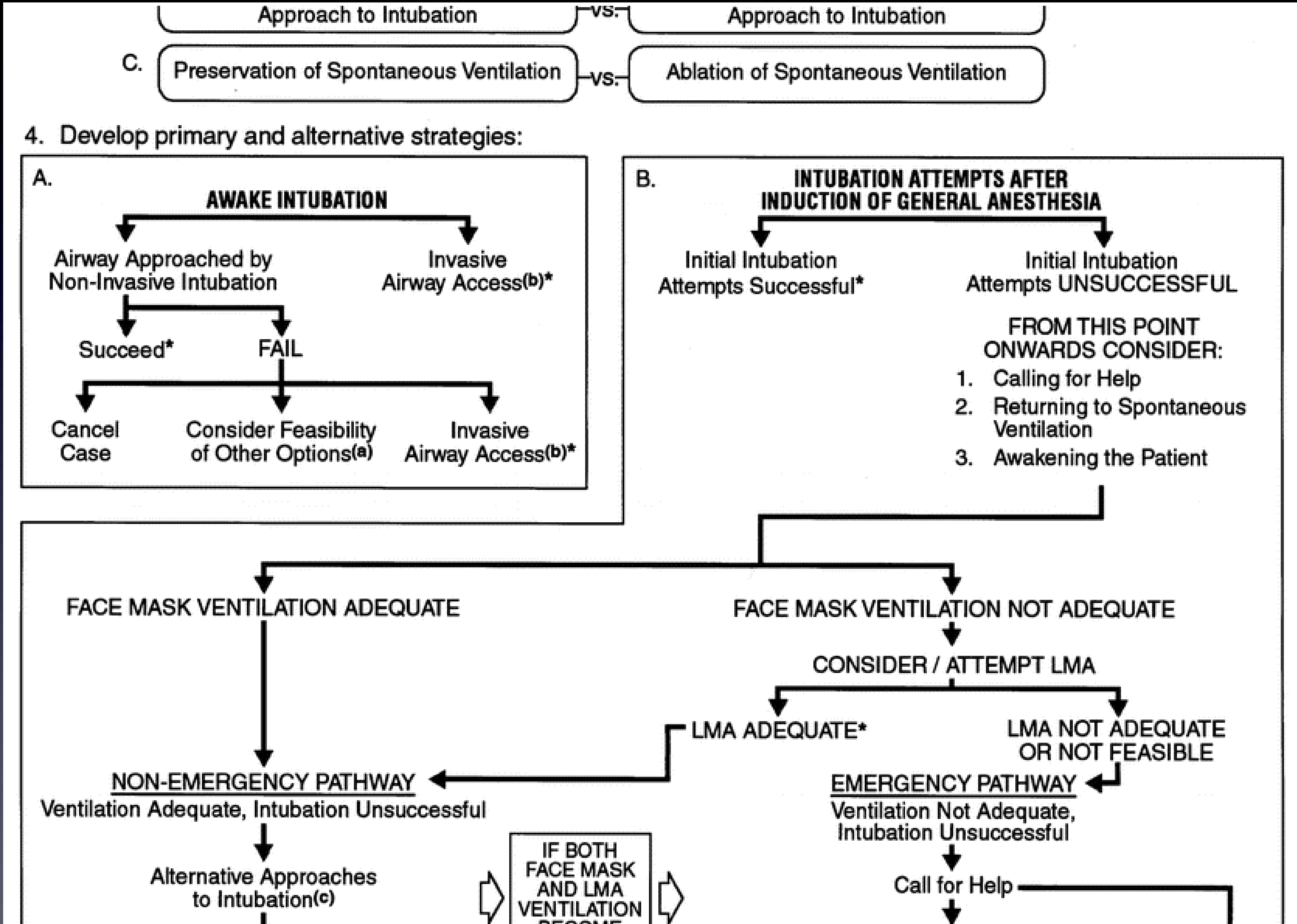
sive airway access includes surgical or percutaneous
neostomy or cricothyrotomy.

c. Alternative non-invasive approaches to difficult intubatio
(but are not limited to): use of different laryngoscope bla
as an intubation conduit (with or without fiberoptic guida
fiberoptic intubation, intubating stylet or tube changer, li
retrograde intubation, and blind oral or nasal intubation.

d. Consider re-preparation of the patient for awake intubati
canceling surgery.

e. Options for emergency non-invasive airway ventilation in
are not limited to): rigid bronchoscope, esophageal-tracheal
ventilation, or transtracheal jet ventilation.

MANEJO VIA AEREA DIFICIL



VENOPUNCIÓN DIFÍCIL

**trasound-assisted internal jugular vein
theterization in the ED.**

ics P, Wilber S, Blanda MP, Gallo U.

partment of Emergency Medicine, Summa Health System/Akron Ci
spital, Northeastern Ohio Universities College of Medicine, USA.

VENOPUNCIÓN DIFÍCIL

ltrasound-guided subclavian vein cannulation in fants and children: a novel approach.

rotte T, Veyckemans F.

partment of Anaesthesia, Université Catholique de Louvain, Cliniques iversitaires St-Luc, Brussels, Belgium. thierry.pirotte@clin.ucl.ac.be

VENOPUNCIÓN DIFÍCIL

ltrasound guidance for central vascular access in
e pediatric emergency department.

ippen P, Kissoon N.

vision of Pediatric Critical Care Medicine, Department of Pediatrics,
iversity of British Columbia, Vancouver, British Columbia, Canada.

VENOPUNCIÓN DIFÍCIL

NICE guidelines for central venous atheterization in children. Is the evidence base ufficient?

. R. Grebenik[*], A. Boyce, M. E. Sinclair, R. D. Evans, D. G. Mason ar . Martin[1]

uffield Department of Anaesthetics, John Radcliffe Hospital, Oxford OX3 DU, UK [1] Present address: The Heart Hospital, London, UK

VENOPUNCIÓN DIFÍCIL

Table 1: Types of commercially available catheter

Catheter type	Advantages	Disadvantages
Non-tunnelled catheters	Choice of sites Easy to insert and remove Multiple lumina available	Short-term use
*Skin-tunnelled catheters	Lower infection rates than non-tunnelled Long-term use	More complex insertion and removal
Ports	No external catheter Cosmetically attractive Patient can swim/bathe as normal Low maintenance Long-term use Lower infection rates than skin-tunnelled catheters	Surgical insertion and removal Less suitable for frequent repeated access
Apheresis/dialysis catheters	Permit high blood flow rates	Large bore Require flushing with concentrated heparin (for example 5,000u/ml, according to manufacturer guidelines) solution to maintain patency. Flush solution must be withdrawn prior to use
Non-tunnelled (e.g. Vascath ™ Kimal)	Easier to insert and remove	Short-term use
Skin-tunnelled	Lower infection rates than non-tunnelled devices Long-term use Good for patients with poor peripheral access who require both PBSC harvest and transplant procedure	Complex insertion and removal Best inserted via internal jugular or femoral routes
PICCs	Easy to insert and remove Do not require platelet support or correction of clotting prior to insertion/removal	Higher thrombosis rate particularly with polyurethane variety Polyurethane variety required to infuse blood/platelets because have greater internal diameter than silicone variety Slower flow rates particularly in silicone/valved varieties Catheter longevity lower than with

VENOPUNCIÓN DIFÍCIL

Table 2: Catheter flushing protocols

Catheter Type	Solution	Frequency	Cautions
Non-tunnelled	10ml saline 0.9% +/- 5ml heparinised saline solution (10u/ml)	After each access when used intermittently, or weekly	
*Skin-tunnelled	10ml saline 0.9% +/- 5ml heparinised saline solution (10u/ml)	After each access or weekly	
*Ports	10ml saline 0.9% +/- 5ml heparinised saline solution (10u/ml)	After each access or monthly	Do not use a syringe smaller than 10mls in size, to avoid catheter rupture
Apheresis/dialysis	10ml saline 0.9% plus 1000u/ml or 5000u/ml ***Catheter volume only***	After each access or weekly	Calculate "dead space volume" to avoid systemic heparinisation – usually printed on the CVC lumen
*PICCs	10ml saline 0.9% +/- 5ml heparinised saline solution (10u/ml)	After each access, or at least weekly	

VENOPUNCIÓN DIFÍCIL

Indications for catheter insertion

ese catheters are indicated (a) when venous access is poor, (b) when embarking
olonged intravenous chemotherapy and/or Total Parenteral Nutrition (TPN), or
peated administration of blood products, (c) when intravenous therapy involves dr
own to be venous sclerosants, (d) when ambulatory chemotherapy is to be given
out-patient, (e) in the situation of repeated sampling or venesection.

VENOPUNCION DIFICIL

Partial and complete catheter blockage is evidenced by difficulty in aspirating blood or infusing fluid. Forcible introduction of fluid down an obstructed lumen may cause catheter rupture. Catheter occlusion may include blockage due to kinking of the catheter, "pinch off syndrome", occlusion of the catheter tip on the vessel wall, fibrin sheath or fibrin flap or luminal thrombus, or migration of the tip into a smaller vessel. Plain X-ray or a catheter contrast study may be helpful in confirming the diagnosis. Initially, fibrin sheaths manifest with catheter dysfunction, progressing to complete failure. They are usually discovered 1-2 weeks after placement (Crain *et al* 1998). Infusion substances can penetrate between the catheter wall and the fibrin sheath in a retrograde manner, along the catheter to the site of venous insertion, and even out to perivascular and subcutaneous layers. This can lead to cutaneous or subcutaneous necrosis. Untreated fibrin sheaths are associated with increased risk of complications, but interventional radiologists may be able to temporarily salvage catheter function by using percutaneous, intravascular fibrin sheath stripping via a trans-femoral approach (Knutstad *et al* 2003).

Where catheter occlusion is due to thrombus without symptomatic thrombosis, instillation of Hepsal (heparin sodium 10 units/ml) may be effective. If not, urokinase 10,000 u/ml reconstituted in 4ml normal saline may be tried, using 2ml of solution into each catheter lumen and ensuring that intra-luminal volumes only are instilled. Urokinase is manufactured by Medac and is available on a named patient basis. The solution should be injected gently into the catheter with a push-pull action to maximize mixing within the lumen. The lumen should then be clamped and left for at least 2-3 hours. The catheter should then be unclamped and the solution containing disaggregated clot aspirated (Dougherty 2004; Gabriel 1999). It has not been shown to be cost-effective or clinically necessary to leave the solution in the lumen for longer periods, such as between episodes of haemodialysis. An alternative to urokinase is Cathflo Activase (Alteplase) which is a recombinant human tissue plasminogen activator (t-PA) (Deicher SR et al, 2002). Again, this is available on a named patient basis and is manufactured by Genentech.

Other reasons for catheter malfunction can include damage to the catheter. For example, "pinch off" as described earlier, or kinking of the catheter. Occasionally the tip of the catheter can migrate, particularly if the catheter is short and the tip initially lies in the upper superior vena cava or brachiocephalic vein. This may result in the catheter ceasing to function. Repeat chest X-rays may help in diagnosing these problems.

VENOPUNCIÓN DIFÍCIL

Implanted ports

s have been shown to have the lowest reported rates of catheter-related bl
am infections compared to either tunnelled or non-tunnelled CVC (Groeger e
3; Pegues *et al* 1992). Most ports are single lumen, which makes them more su
ong-term intermittent therapy. They tend to be used more frequently in paediat
in patients with solid tumours (Camp-Sorrell 1992; Gabriel 1999). In the a
matology setting, they may be of use in sickle cell anaemia or thalassaemia, wh
ents are receiving regular blood transfusions. Ports may also be useful for onco
ents with poor peripheral venous access who are receiving less intensive the
kely to cause prolonged neutropenia. They allow less restricted bathing
mming and may appeal to patients concerned about the psychological aspects of
sence of the external part of the non-implanted catheters. They are more expen
urchase, insert and remove, and they leave larger scars.

CONSORCI
HOSPITAL GENERAL
UNIVERSITARI
VALÈNCIA

Anestesia Pediátrica