Tan Tock Seng HOSPITAL | National Healthcare Group Adding years of healthy life | Imperial College London | Lee Kong Chian School of Medicine | A Joint Medical School by Imperial College London and Nanyang Technological University | NANYANG TECHNOLOGICAL UNIVERSITY

Surgical treatment of Advanced Thyroid Malignancies

Dr Jeeve Kanagalingam

MA (Cambridge), BM BCh (Oxford), DLO, DOHNS, FRCS (ORL-HNS), FAMS

Consultant ENT / Head and Neck Surgeon

Tan Tock Seng Hospital

Adj Asst Professor in Otolaryngology

Lee Kong Chian School of Medicine

Thyroid surgery

Theodor Billroth (1829–94).

- Father of thyroid surgery
- Performed 20 (1861-67)
- 8 died (40%)
- Gave it up briefly!
- When he resumed surgery, '*his clinic was cursed by post operative tetany, and 30% cord paralysis rate'*

What are advanced thyroid malignancies?

Well differentiated thyroid cancer (incl Medullary)

- T4a

  Invasion of the subcutaneous tissue, larynx, trachea or oesophagus

- T4b

  Invasion of the prevertebral fascia or encasement of the carotid / mediastinal vessels

All Anaplastic cancers

- T4a

  Intrathyroidal

- T4b

  Gross extrathyroidal extension

Advanced thyroid cancer

- Although the outcome for well differentiated cancer is good, it is poor for advanced stage disease
- Recurrence may occur late
- Anaplastic cancer has a dismal prognosis

Tumour type	10-year relative survival	
Papillary	93%	
Follicular	85%	**39%**
Hurthle	76%	
Medullary	75%	**21%**
Anaplastic	14%	

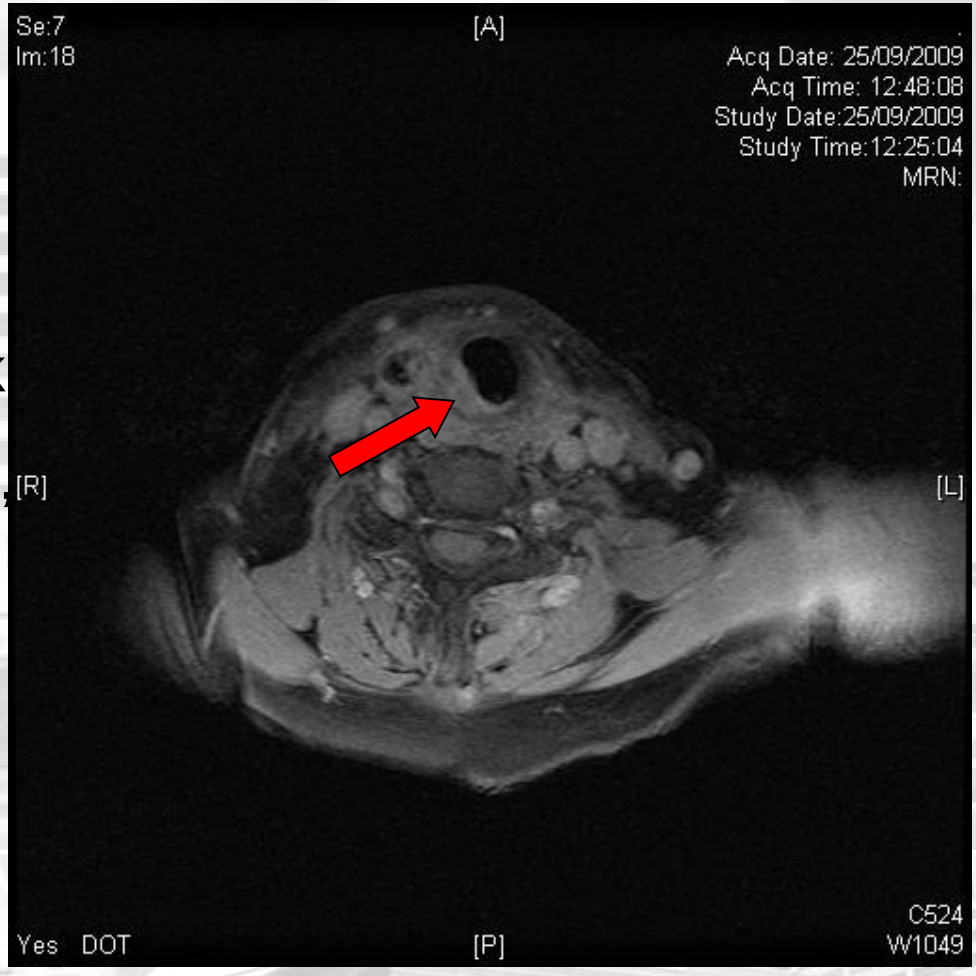
Structures involved by invasive thyroid cancers

Structure involved	Incidence
Strap muscles	53%
Rec laryngeal nerve	47%
Larynx	12%
Trachea	37%
Oesophagus	21%
Other	30%

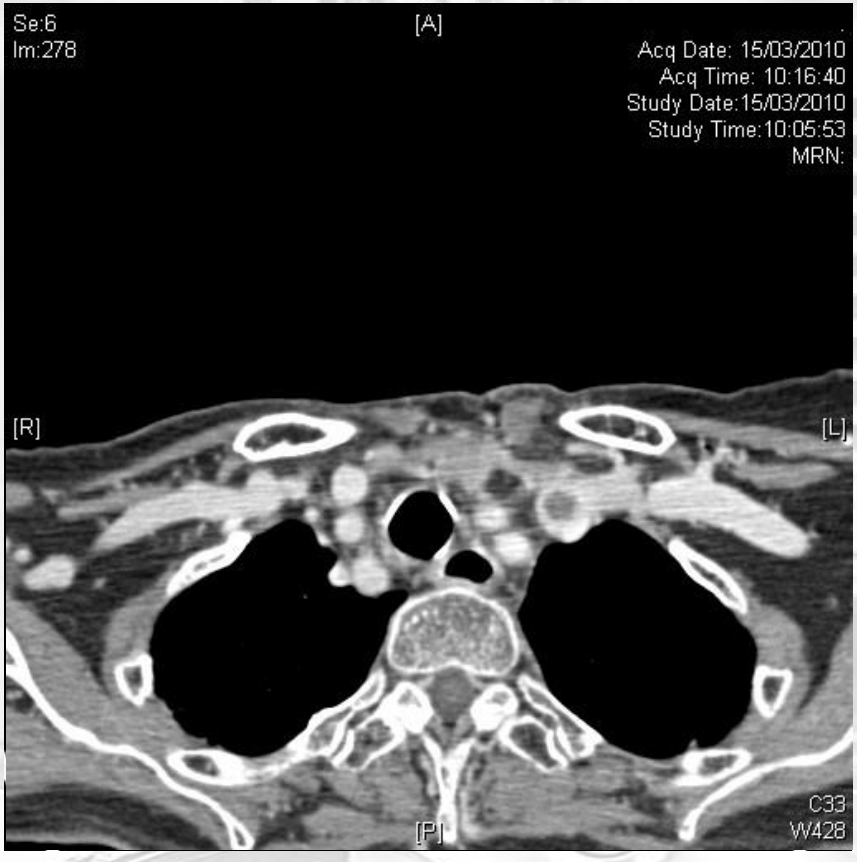
Source: McCaffrey TV, Bergstralh EJ, Hay ID. Locally invasive papillary thyroid carcinoma:1940–1990. Head Neck 1994; 16:165–172.

Thorough work-up

- Meticulous examination
- Flexible nasendoscopy
- Imaging
  - Ultrasound of the neck
  - Reserve MRI for bulky, fixed and retrosternal thyroids
  - CT remains acceptable
- Review pathology

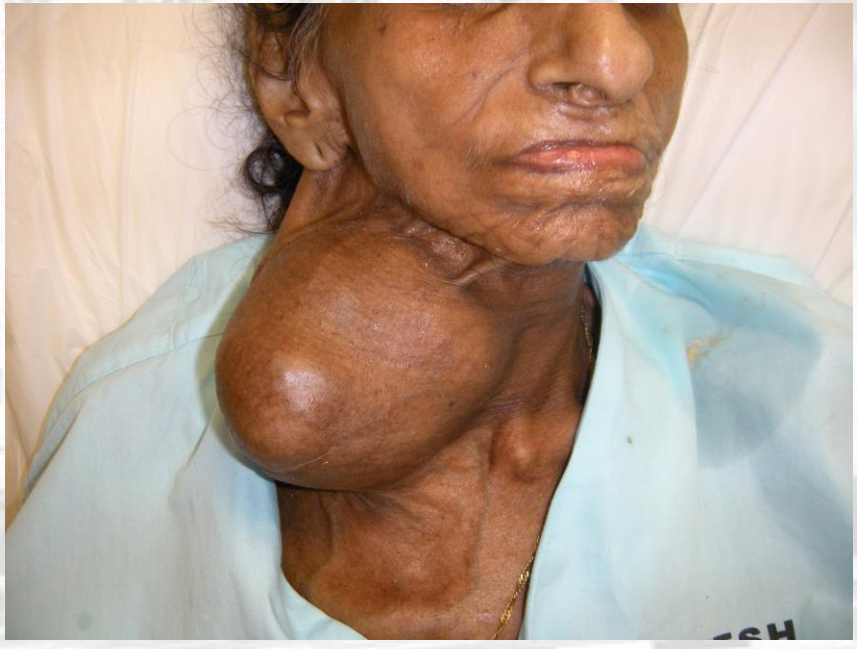


Review pathology



Controversies in the principles of treatment

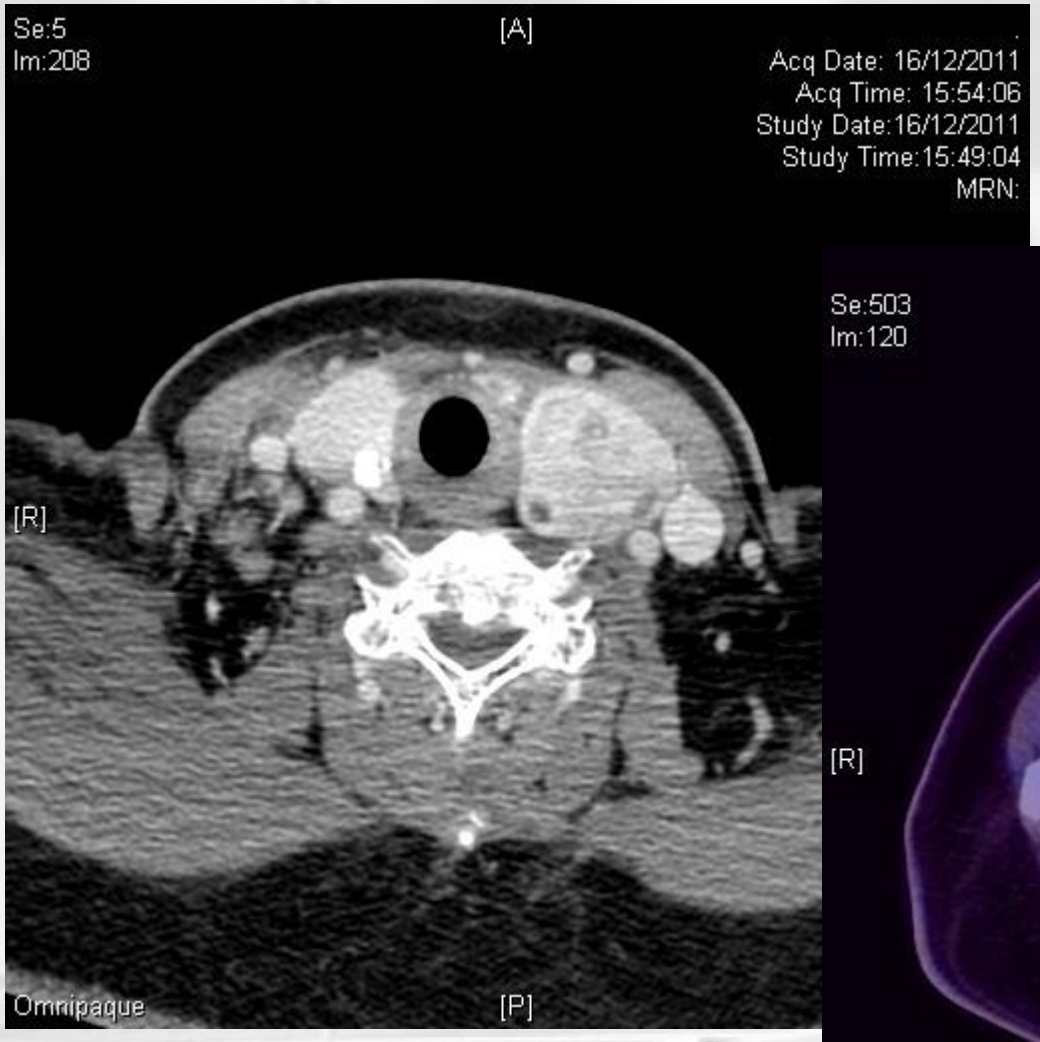
- Resecting disease with negative margins is best
- Sacrificing vital structures e.g. larynx carries significant morbidity
- Some authors suggest ‘shaving’ tumour off vital structures with adjuvant I^{131} and EBRT achieves similar outcomes
- Others argue for en bloc resection



Recurrent laryngeal nerve

- If vocal cord is paralysed pre-op and the nerve found to be involved, en bloc resection is best
- If vocal cord is functioning, but tumour involves / encases nerve
  - Attempt peeling
  - If not possible, resect after ensuring contralateral nerve is sparred
- There is no difference in local, regional or distant recurrence or survival in patients with pre-operatively functioning cords who have their RLN peeled from disease
- The 'peeled' nerve recovers in 60% (most – 4/5 – within 6 months)

Nishida T, Nakao K, Hamaji M, et al. Preservation of recurrent laryngeal nerve invaded by differentiated thyroid cancer. Ann Surg 1997; 226:85–91.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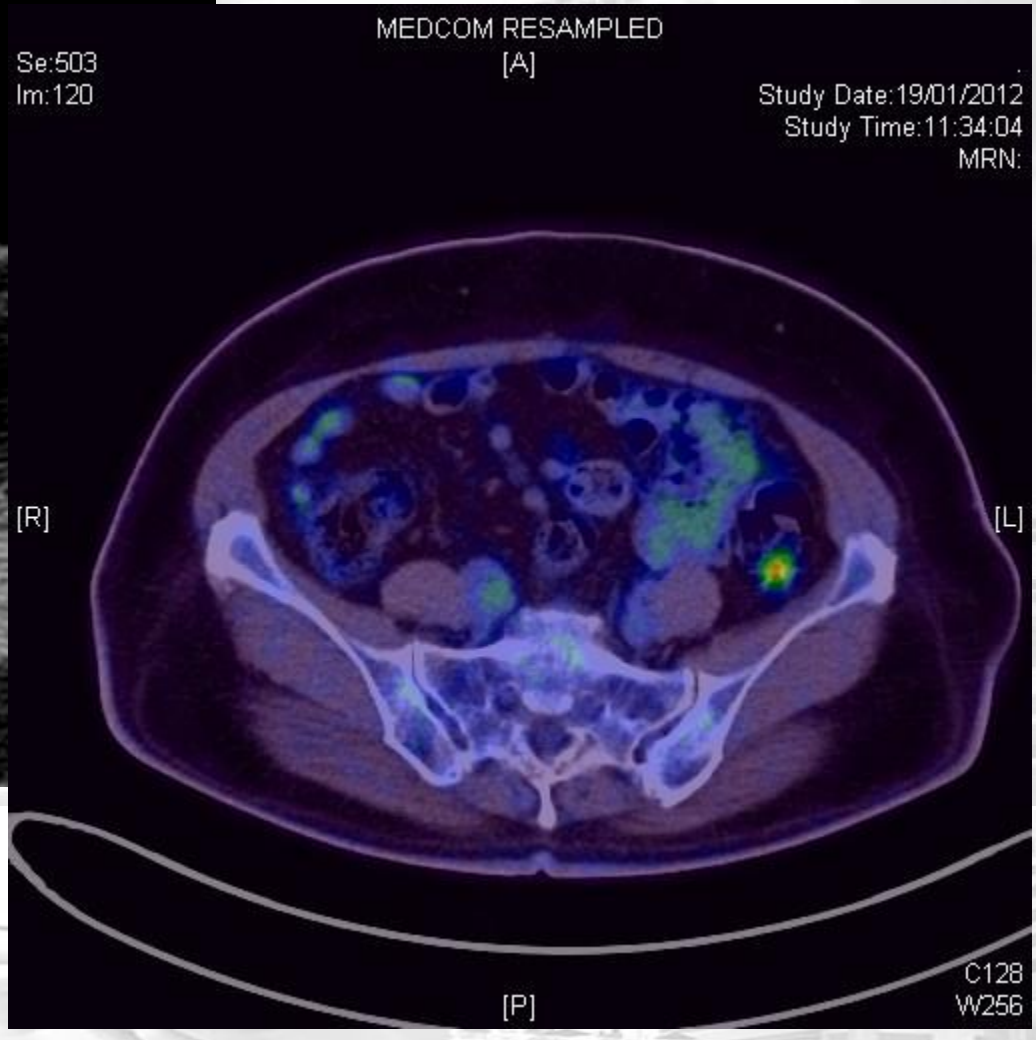
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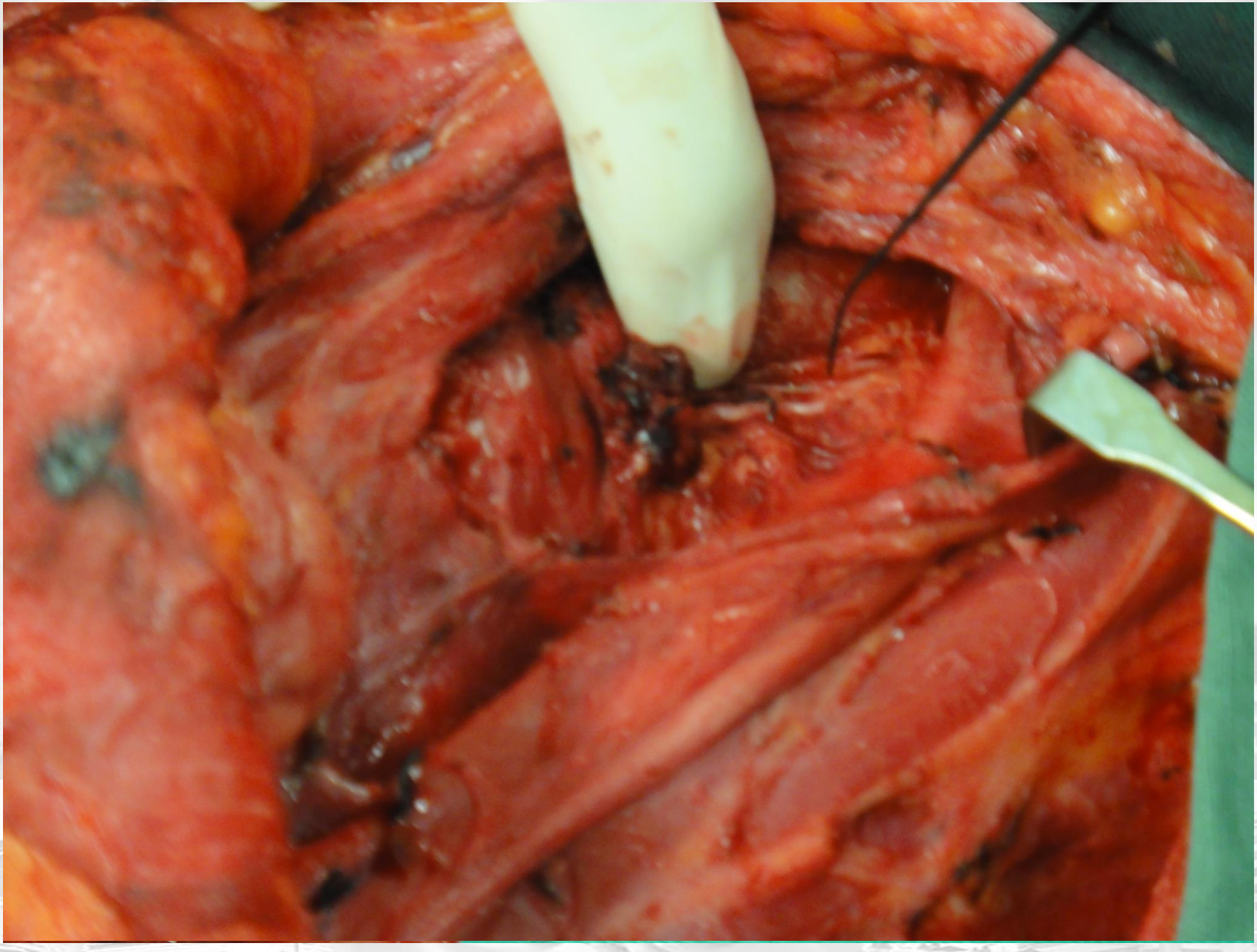
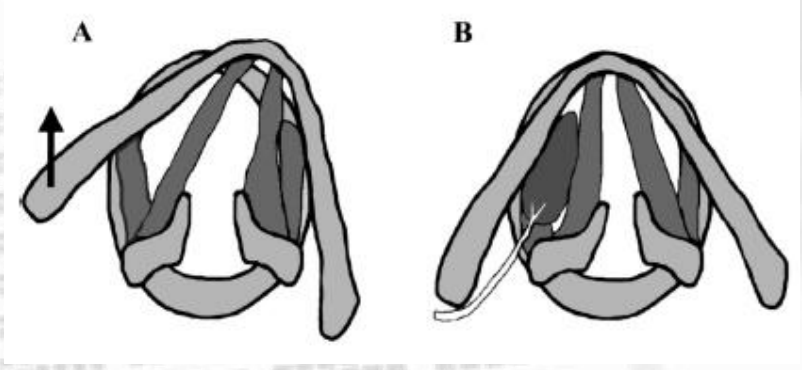
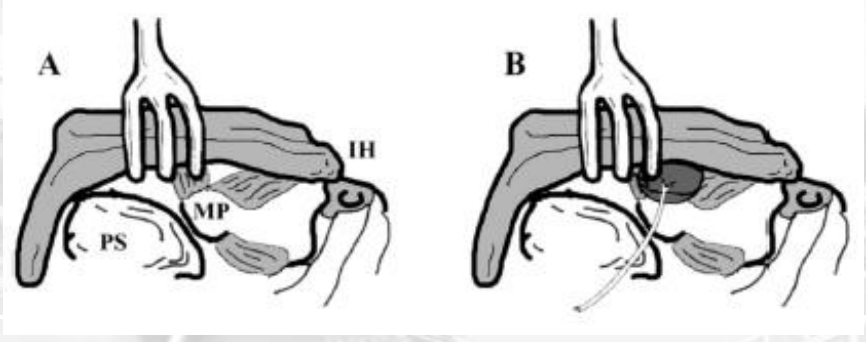


What to do if you sacrifice the nerve?

- Yumoto showed that immediate reconstruction with primary anastomosis or cable-grafting with great auricular nerve gave good functional results
- But if long length of RLN sacrificed, a sternothyroid nerve muscle pedicle with ansa cervicalis is best

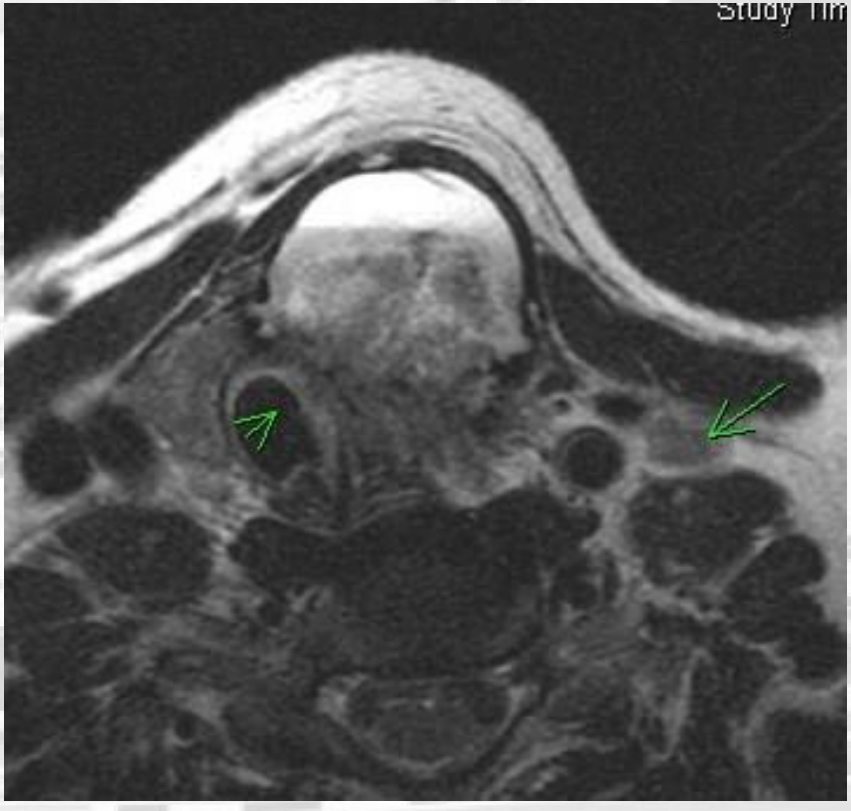


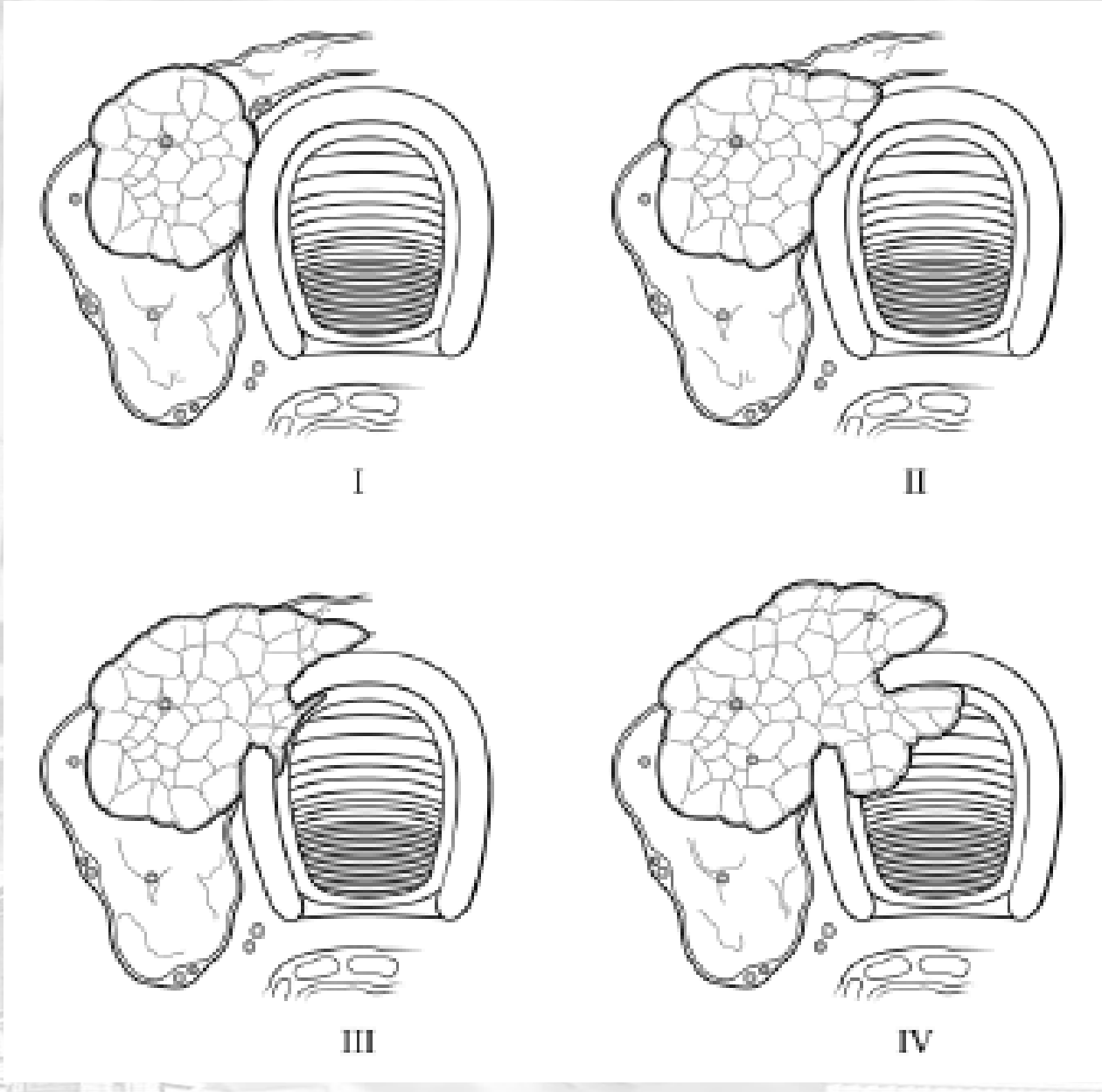


Yumoto E, Sanuki T, Kumai Y. Immediate recurrent laryngeal nerve reconstruction and vocal outcome. Laryngoscope 2006; 116:1657–1661

Laryngotracheal invasion

- Tsumori reported that 50% of papillary and follicular carcinomas which invaded the airway showed poor differentiation (cf 11.4% of noninvasive thyroid cancers)
- Shin classification is widely used
- Controversy remains as to what constitutes an adequate resection




I
II
III
IV

Laryngotracheal invasion - management

- Tracheoscopy remains the gold standard in assessing invasion'
- Retrospective studies have shown that when all macroscopic disease is removed - by shave or radical resection - there is no difference in outcome
- Segal showed there is not added benefit in 5 year survival by removing microscopic disease by radical resection
- Some authors propose 'shave' procedures for Shin stages I-II with radical resection for stages II-IV
- For the larynx, it is possible to resect 50% of the thyroid cartilage and 30% of the cricoid without need for laryngectomy
- Occasionally, a small window in the anterior tracheal wall can be used as a fenestration for a tracheostomy

Segal K, Shpitzer T, Hazan A, et al. Invasive well differentiated thyroid carcinoma: effect of treatment modalities on outcome. Otolaryngol HeadNeck Surg 2006; 134:819–822.

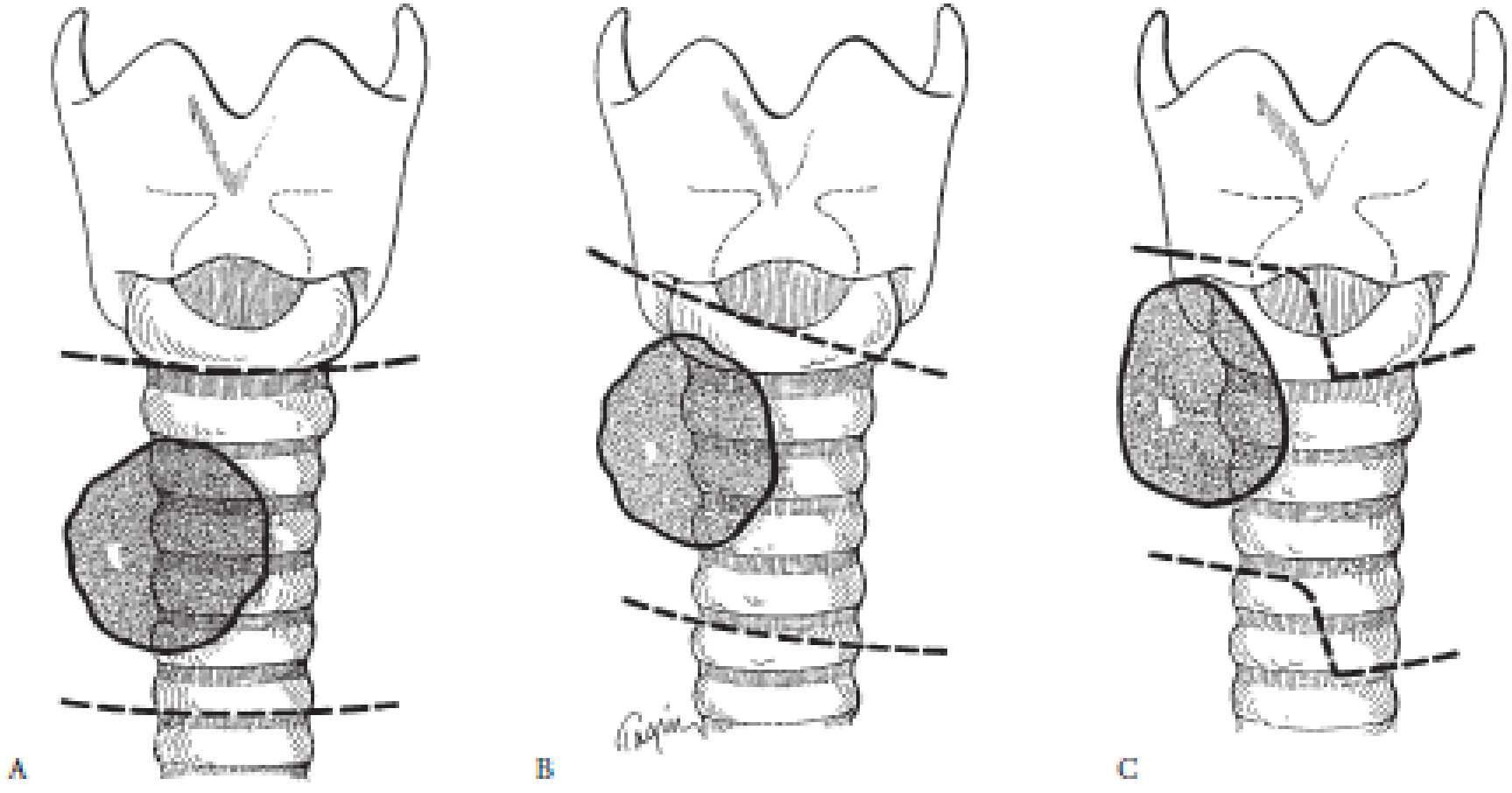
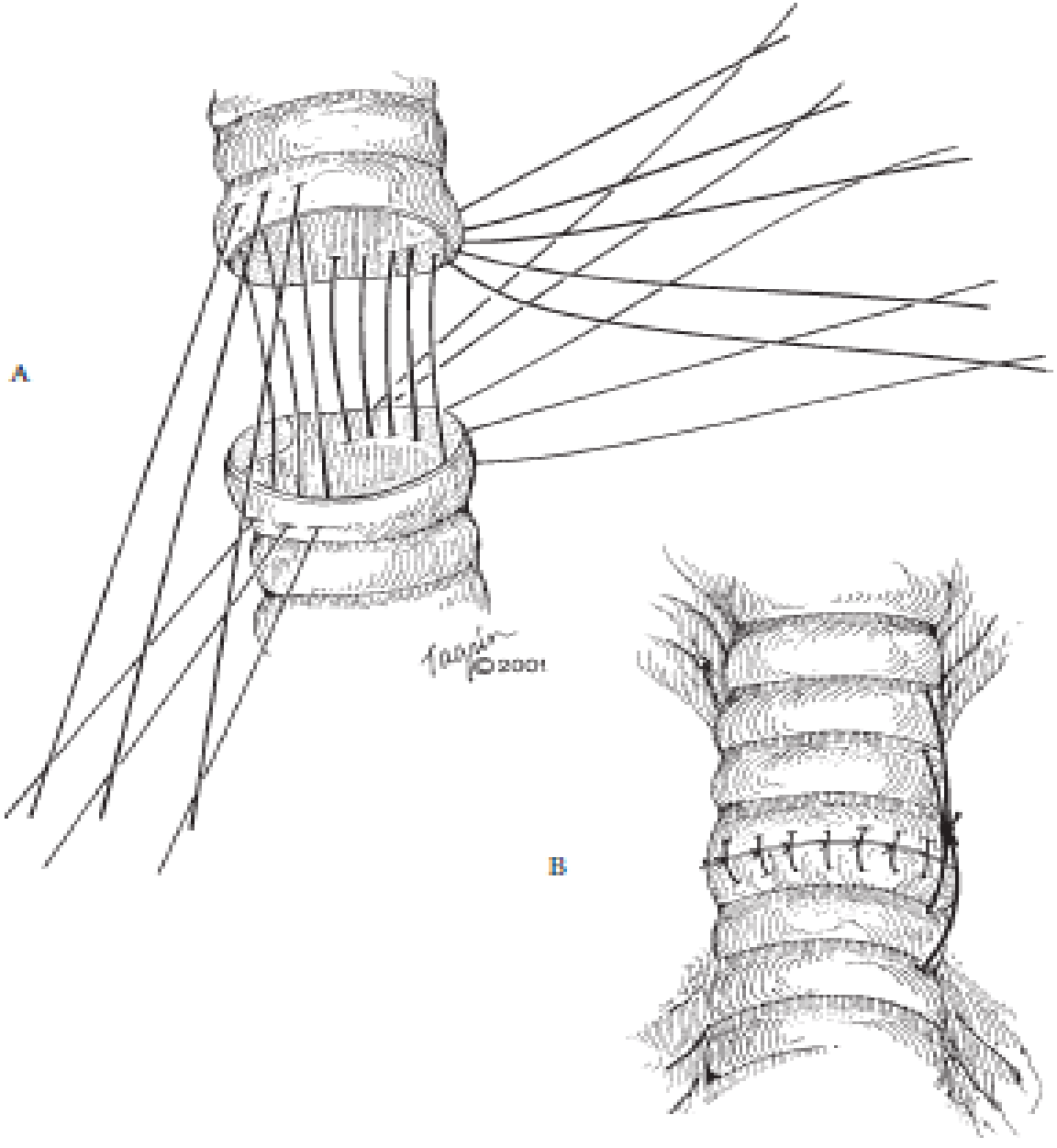


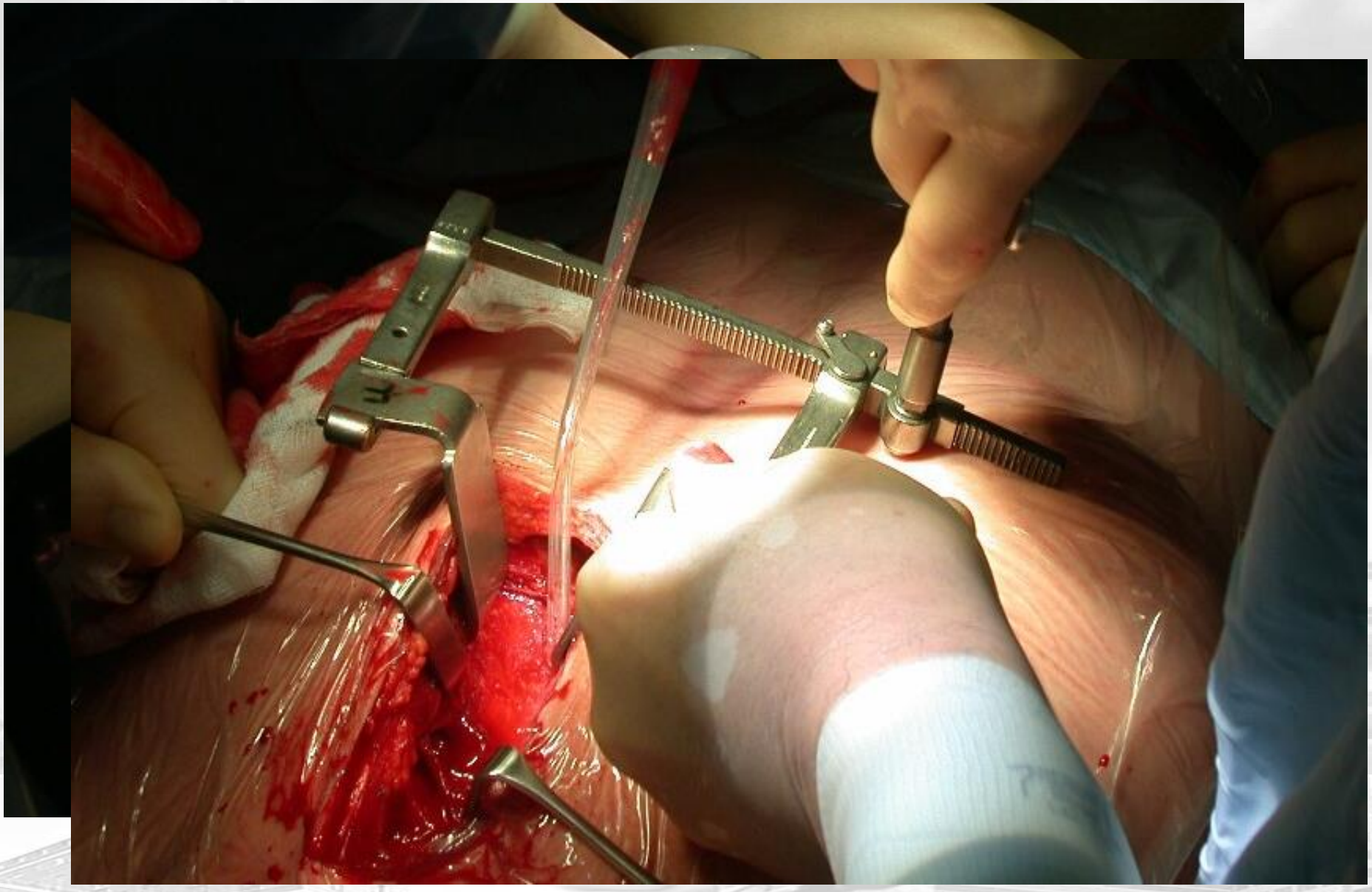
FIGURE 8-10 *Modes of resection of thyroid cancer invading trachea. A, Cylindrical tracheal resection. Because of the location of the thyroid gland, invasion most frequently requires that proximal transection of the trachea be just below the cricoid cartilage. B, Varying amounts of cricoid must often be removed on the side of the tumor, from a slightly oblique beveled resection to a nearly complete lateral excision, as diagrammed. C, "Bayonet" resection, where invasion of the cricoid is so extensive that the line of transection must lie somewhere beneath the vocal cord on that side. The inferior line of tracheal transection in this case is fashioned to fit the proximal laryngeal defect.*


A
B

Oesophageal involvement

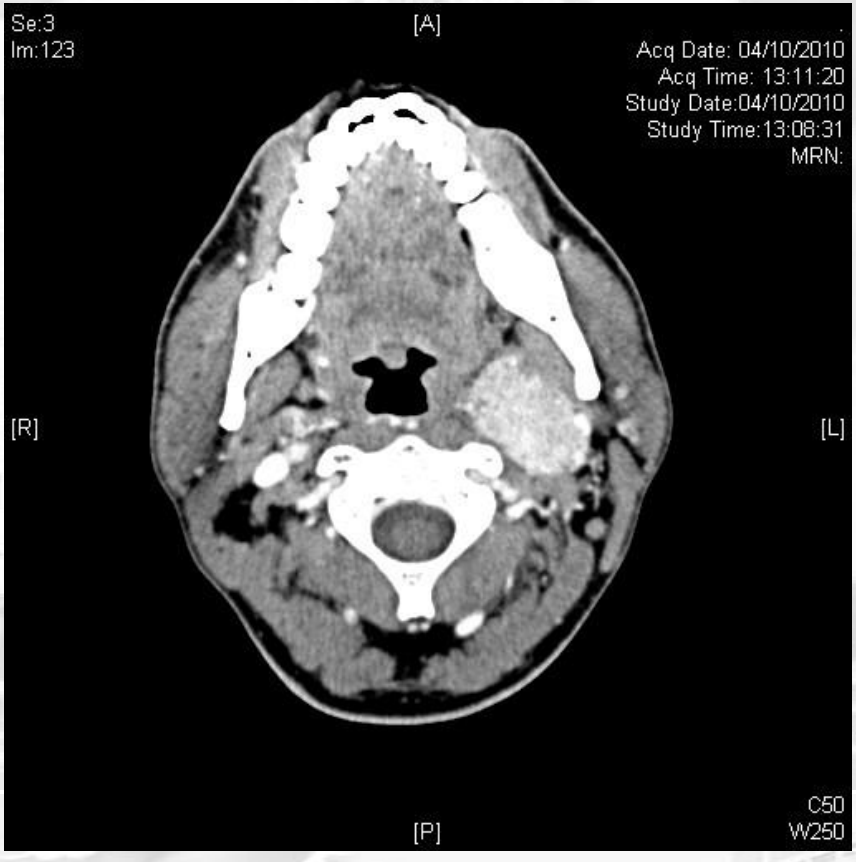
- Oesophageal mucosa is relatively resistant to invasion so most often only the muscularis layer is involved
- Resection with negative margins is necessary
- Small defects can be closed primarily if there is no tension
- Circumferential defects require reconstruction with a flap

Cervicothoracic disease



Carotid encasement

- If less than complete circumferential involvement, it may be possible to resect disease
- Otherwise, perform total balloon occlusion (TBO) and cerebral blood flow tests to assess circle of Willis
- Complete resection with saphenous vein or PTFE graft reconstruction is described



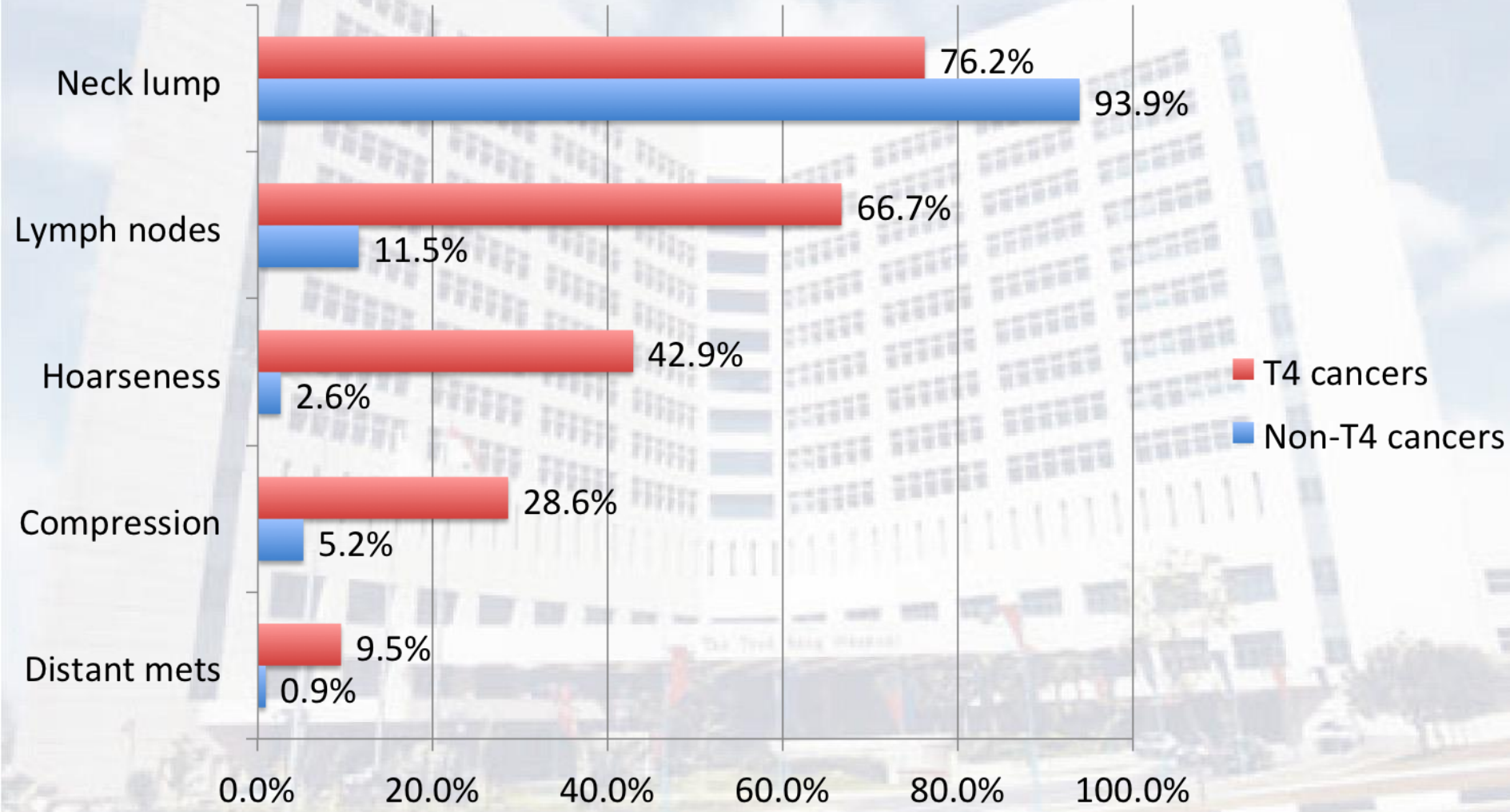
T4 cancers in TTSH (2001-2008

21 patients

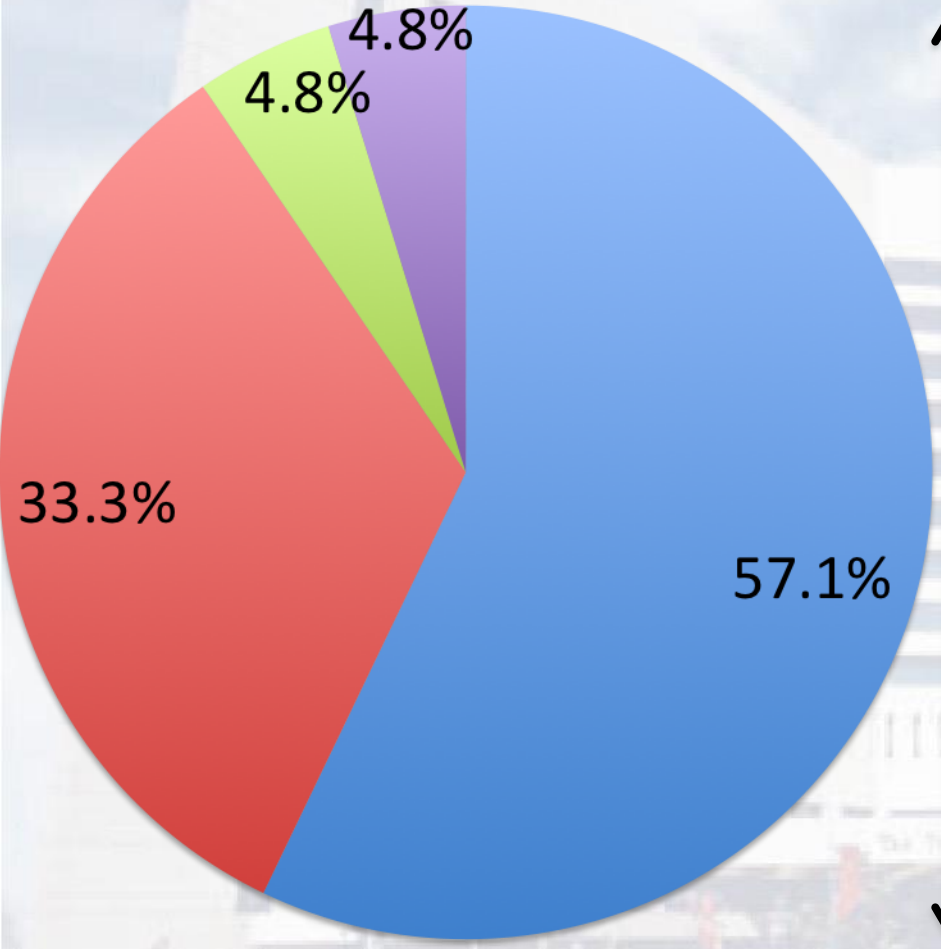
Median age: **68.3** years

Median age: **58.4** years

Results – presentation



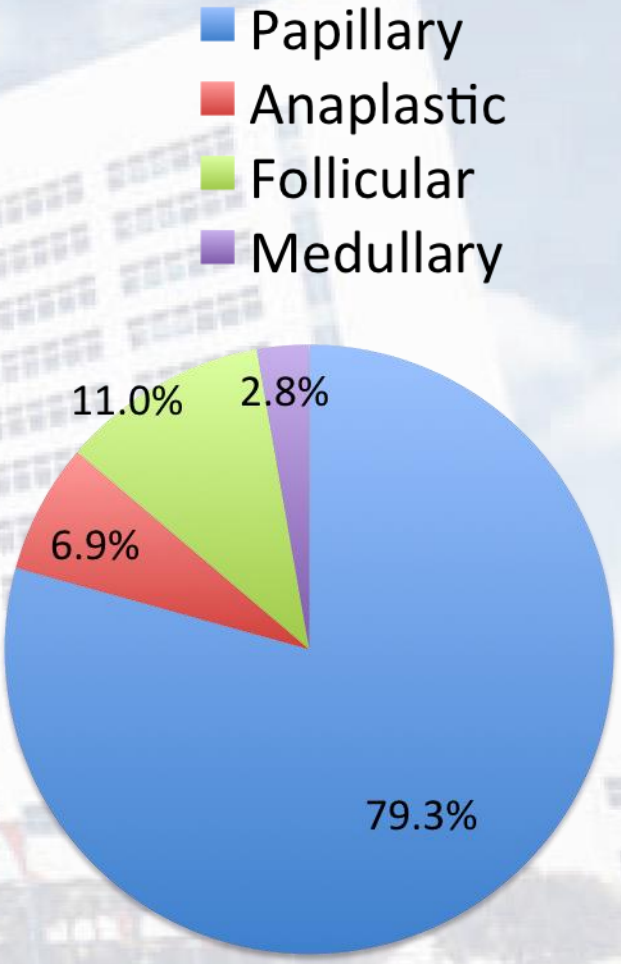
Results - histology



T4 Tumours (n=21)

4 cm

2 cm



All thyroid cancers (n=145)

Results – treatment

Radical surgery with adjuvant (n=9)

- **DD** (n=2)
- **AWD** (n=2)
- **AF** (n=4)
- Unknown (n=1)

Total thyroidectomy with adjuvant* (n=12)

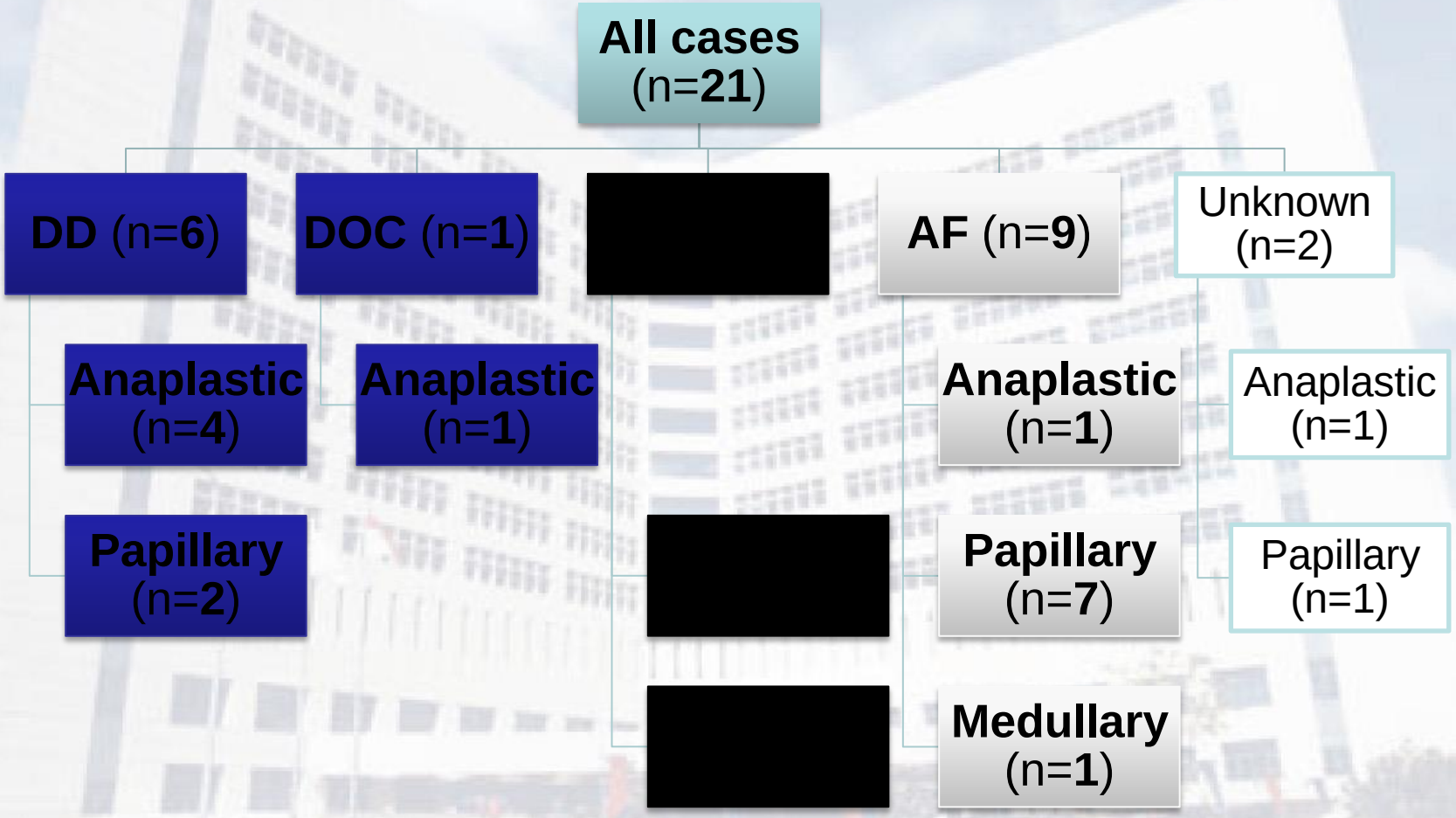
- **DD** (n=4)
- **DOC** (n=1)
- **AF** (n=6)
- Unknown (n=1)

*2 patients with anaplastic cancer did not receive adjuvant

DD – **d**ead from **d**isease
DOC – **d**ead from **o**ther **c**ause

AWD – **a**live, **w**ith **d**isease
AF – **a**live, **f**ree of disease

Results – outcome

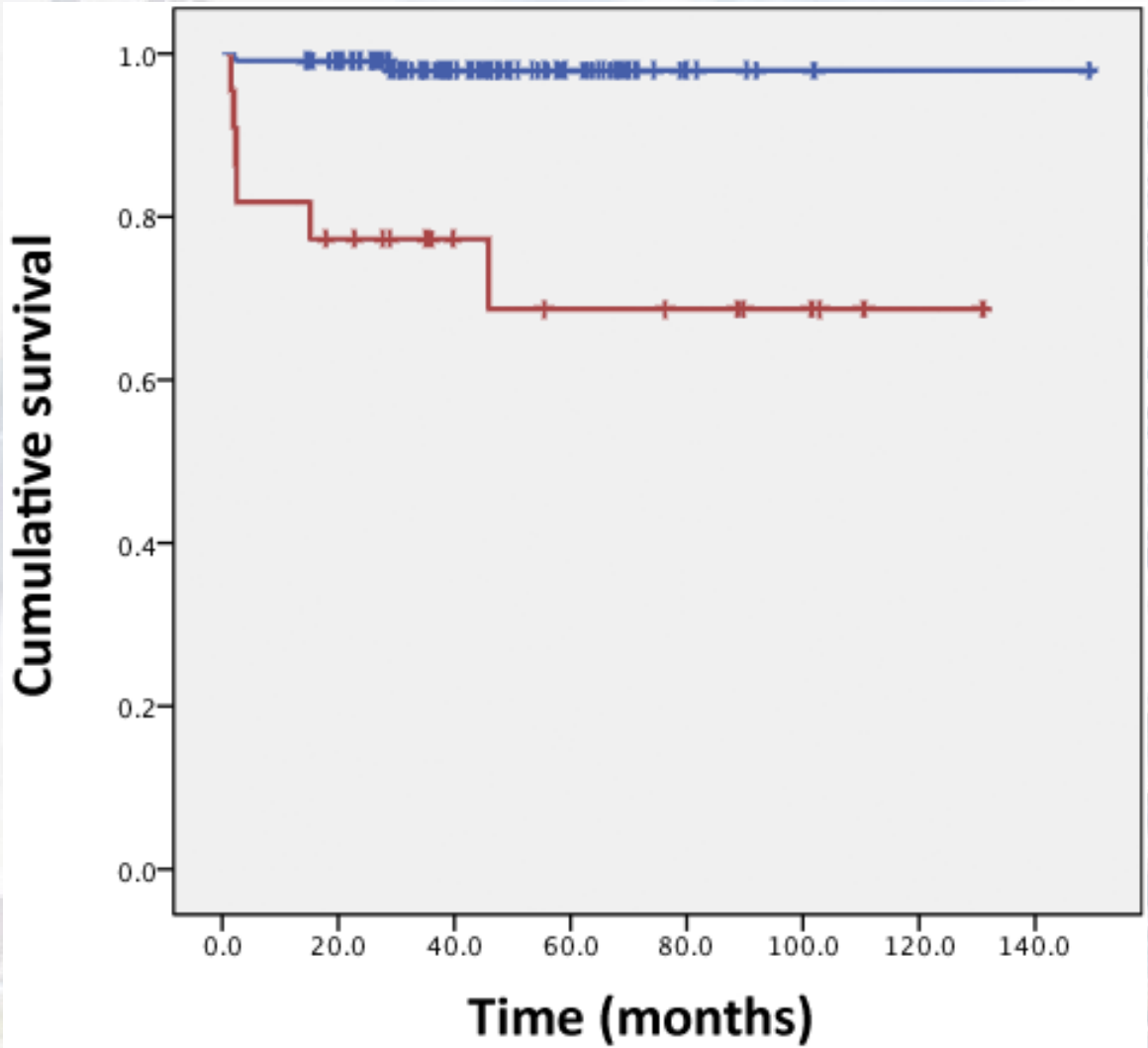


DD – **d**ead from **d**isease
DOC – **d**ead from **o**ther **c**ause

AWD – alive, **w**ith **d**isease
AF – alive, **f**ree of **d**isease

Results – survival

Mean follow up time was 42.9 months



- Non-T4 tumours
- **T4 tumours**

In comparison…

	Our Study	Segal et al. (2006)
Demographics T4 vs general	**1.4x** more **males** **15.6** years **older**	**1.6x** more **males** **13.6** years **older**
Size of tumour T4 vs general	**2x** larger	Larger
Presentation	**Dysphagia**, dyspnea **Hoarseness** Distant metastasis	**Dysphagia** **Hoarseness**
Deaths	**29%** (median **2 months**)	**29%** (median **3.4 years**)
Survival	**71%** at 5 years	**78%** at 5 years

Karl Segal et al. *Invasive well-differentiated thyroid carcinoma: Effect of treatment modalities on outcome*. Otolaryngology–Head and Neck Surgery (2006) 134, 819-822