Surgical treatment of Advanced Thyroid Malignancies

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Thyroid surgery

- 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.

<table>
<thead>
<tr>
<th>Tumour type</th>
<th>10-year relative survival</th>
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<tbody>
<tr>
<td>Papillary</td>
<td>93%</td>
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<tr>
<td>Follicular</td>
<td>85%</td>
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<tr>
<td>Hurthle</td>
<td>76%</td>
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<tr>
<td>Medullary</td>
<td>75%</td>
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<tr>
<td>Anaplastic</td>
<td>14%</td>
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# Structures involved by invasive thyroid cancers

<table>
<thead>
<tr>
<th>Structure involved</th>
<th>Incidence</th>
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<tbody>
<tr>
<td>Strap muscles</td>
<td>53%</td>
</tr>
<tr>
<td>Rec laryngeal nerve</td>
<td>47%</td>
</tr>
<tr>
<td>Larynx</td>
<td>12%</td>
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<tr>
<td>Trachea</td>
<td>37%</td>
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<tr>
<td>Oesophagus</td>
<td>21%</td>
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<tr>
<td>Other</td>
<td>30%</td>
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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 spared
- 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)

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
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.

FIGURE 8-10  Modes of resection of thyroid cancer invading tracheae.  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 bevelled 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.
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

- Neck lump: 76.2% T4 cancers, 93.9% Non-T4 cancers
- Lymph nodes: 66.7% T4 cancers, 11.5% Non-T4 cancers
- Hoarseness: 42.9% T4 cancers, 2.6% Non-T4 cancers
- Compression: 28.6% T4 cancers, 5.2% Non-T4 cancers
- Distant mets: 9.5% T4 cancers, 0.9% Non-T4 cancers
Results - histology

T4 Tumours (n=21)
- Papillary: 57.1%
- Anaplastic: 4.8%
- Follicular: 4.8%
- Medullary: 4.8%

All thyroid cancers (n=145)
- Papillary: 79.3%
- Anaplastic: 11.0%
- Follicular: 6.9%
- Medullary: 2.8%
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 – dead from disease
DOC – dead from other cause
AWD – alive, with disease
AF – alive, free of disease
Results – outcome

All cases (n=21)

- DD (n=6)
  - Anaplastic (n=4)
  - Papillary (n=2)
- DOC (n=1)
  - Anaplastic (n=1)
- AF (n=9)
  - Anaplastic (n=1)
  - Papillary (n=7)
  - Medullary (n=1)
- Unknown (n=2)

DD – dead from disease
DOC – dead from other cause
AWD – alive, with disease
AF – alive, free of disease
Results – survival

Mean follow up time was 42.9 months

- Non-T4 tumours
- T4 tumours
In comparison...

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