CLASSIFICATION OF THYROID DISEASES: SUGGESTIONS FOR A REVISION

I. Diseases characterized by (tissue) euthyroidism

A. Euthyroid goiter
   1. Diffuse (chronic)
   2. Nodular (chronic)
   3. Diffuse (transient)

B. Tumors
   1. Benign (single nodule)
   2. Malignant
      a. Differentiated (papillary and follicular)
      b. Undifferentiated (anaplastic)
      c. Medullary

C. Thyroiditis
   1. Acute thyroiditis
   2. Subacute thyroiditis (De Quervain’s) (in the euthyroid phase: polar disease)
   3. Chronic autoimmune thyroiditis or Hashimoto’s disease (in the euthyroid phase: polar disease)
   4. Postpartum and silent thyroiditis (in the euthyroid phase: polar disease)
   5. Riedel’s thyroiditis
II. Diseases characterized by (tissue) hyperthyroidism

A. With thyroid gland hyperfunction

1. Hyperthyroid goiter with thyroid-associated ophthalmopathy or Basedow-Graves’ disease⁴
2. Multinodular hyperthyroid goiter or Plummer’s disease
3. Autonomous nodule (hyperthyroid)
4. Rare forms: excessive exogenous iodine, hyperthyroidism due to Hashimoto’s disease (Hashitoxicosis), postpartum thyroiditis (in the hyperthyroid phase), pituitary resistance to thyroid hormones, TSH-secreting pituitary adenoma, chorionic gonadotropin-secreting tumor, adenoma or carcinoma (follicular) of the thyroid

B. Thyrotoxicosis (without thyroid gland hyperfunction)

1. Excessive, exogenous thyroid hormones (thyrotoxicosis factitia and iatrogenic)
2. Postinflammatory or from destruction of the thyroid
3. Amiodarone-induced

C. Transient hyperthyroidism
III. Diseases characterized by (tissue) hypothyroidism

A. With thyroid gland hypofunction

1. Primary hypothyroidism
   a. Adult (iatrogenic (surgery, $^{131}$I therapy, external radiotherapy), chronic autoimmune thyroiditis (in the hypothyroid phase), Graves’ disease (end-stage), diffuse and nodular goiter, iodine deficiency
   b. Neonatal congenital (ectopia, agenesis, dyshormonogenesis)

2. Secondary: hypothalamic-pituitary hypothyroidism (or central)

3. Dyshormonogenetic congenital goiter

B. Without hypothyroidism

1. Generalized and peripheral resistance to thyroid hormones (receptor and postreceptor defects)

C. Transient hypothyroidism

IV. Thyroid-associated ophthalmopathy

V. Abnormal thyroid parameters without thyroid diseases (nonthyroidal illness, deficit of TBG, etc.)
DIAGNOSTIC TOOLS IN THYROID DISEASE

• “in vivo“
  • Ultrasound
  • Scintigraphy
  • 99m Tc 20 min Uptake
  • X – Ray
  • CT
  • MRI

• “in vitro“
  • TSH
  • Thyroxin (FT4)
  • Triiodothyronin (FT3)
  • TPO Antibodies
  • TRAK Antibodies
  • Thyroglobulin
ULTRASOUND OF THE THYROID*

- Every Patient with Suspicion of Thyroid Disease
- B – Mode Linear Array / Sector Array
- 5,0 MHz / 7,5 MHz
- Short / Long Axis Examination
- Measurement of Thyroid Volume (L x W x D x 0,5)
- Evaluation of Lesions, Echos, Margins, Size

HASHIMOTO THYROIDITIS
THYROIDITIS de QUERVAIN
ATROPHIC THYREOIDITIS
GRAVES DISEASE
GRAVES DISEASE
THYROID SCINTIGRAPHY

- 99m Tc (20 – 80 MBq) / 123 I (5 – 20 MBq)
- 2 – 25 min p.i / 4 – 5 h p.i.
- Digital Acquisition / ROI Technique
- Acquisition Time => 5 min
- Gamma – Camera 128x128, 256x256, 64x64 (Zoom 2)
- Image Scale 1 : 1
PITFALLS IN THYROID SCINTIGRAPHY

• Projection of Nodules in AP – Image
• „Decompensated“ Autonomous Nodule
• Aplasia of a Thyroid Lobe
• Masses in the Neck
• After Radiation, Operation
DETECTION AND AVOIDANCE OF ERRORS IN THYROID SPECTROGRAPHY

• Accurate Indication
• Appropriate Radionuclid
• Optimal Imaging Technique
• Consideration of Pitfalls
THYROID SCINTIGRAPHY
20 min 99m Tc Uptake

• Normal 0.5 – 2 %
• Iodine Deficiency 1 – 8 %
• Increased Hormon Synthesis ( Graves Disease ) > 4 %
• Uptake < 1 % ( L - Thyroxin Therapy, Thyroiditis de Quervain, Silent and Postpartum Thyroiditis, Iodine Contamination

GRAVES DISEASE
AUTONOMOUS NODULE
AUTONOMOUS NODULE
AUTONOMOUS NODULE / SUPPRESSION
MEASUREMENT OF TSH

• Mandatory in Screening or Diagnosis of Thyroid Disease
• Functional Sensitivity of Assay <= 0,1 mU/L ( VK <= 20 % )
• MRC Standard, Crossreaction < 0,01 % ( LH, FSH, hCG )
• Separation Euthyroidism / Hyperthyroidism ( Overlap < 1 % )
• No Higdose – hook – effect TSH < 300 mU/L

MEASUREMENT OF T4 and T3*

- Proof of Hyperthyroidism / Hypothyroidism
- Measurement of FT4 and FT3 (TT3)
  Method: Two Step, One Step
- Errors: Medication with Heparin, Barbiturates, ASA, Non Thyroidal Illness, Abnormalities of TBG, TBPA

NON THYROID ILLNESS

Diagram showing levels of thyroid hormones (T3, T4) and their relation to mortality and severity of illness. The graph illustrates different ranges for euthyroid, low T3, and low T3-T4 conditions, indicating potential correlations with mortality and disease severity.
MEASUREMENT OF THYROID RECEPTOR-AB*

- Differential Diagnosis of Hyperthyroidism
- Graves Disease 80 % ( 90 % ) pos. ( rhTSH Rec.)
- No prognostic Value in the Follow-Up
- Rare in Hashimoto / Atrophic Thyroiditis

MEASUREMENT OF THYROID AB TPO (TG)*

- Hyperthyroidism / Hypothyroidism (< 90 %)
- Hashimoto / Atrophic Thyroiditis (90 %)
- Subclinical Hypothyroidism
- Hypoechoic Tissue in Ultrasound
- Method: RIA, ELISA, IRMA
- Standard MRC 66/367, IU / L
- TG-AB when TPO neg (40 % / 60 %)

MEASUREMENT OF THYROGLOBULIN

- Athyroidism
- Hyperthyroidosis factitia

DIAGNOSIS OF THYROID DISEASES - WHEN?

• Goiter Growth
• Suspicion of Hyperthyroidism
• Suspicion of Hypothyroidism
SCREENING FOR THYROID DISEASE - WHEN?

- Disturbance of Health
- Neurological/Psychiatric Disorders
- Before and after Iodine Excess
- Previous Thyroid Diseases
SCREENING FOR THYROID DISEASE - HOW?

• TSH (0,1 – 4,5 µU / ml)
• Inspection and Palpation of the Thyroid Gland
HYPERTHYROIDISM

- GRAVES Disease ( Morbus BASEDOWII )
- Autonomy of the Thyroid
- Hyperthyroidism after Iodine Excess
- Thyroiditis ( Postpartum, Silent, de Quervain )
- Iatrogenic Hyperthyroidism
- Pituitary Hyperthyroidism
Italo SVEVO
1861 - 1928
## INCIDENCE

<table>
<thead>
<tr>
<th>Subjects</th>
<th>U. K.*</th>
<th>HU**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>0.8 %</td>
<td>0.65 %</td>
</tr>
<tr>
<td>Twins (λs)</td>
<td>7.9 %</td>
<td>5.3 %</td>
</tr>
<tr>
<td>Relatives (λo)</td>
<td>11.8 %</td>
<td>10.3 %</td>
</tr>
</tbody>
</table>

* Bijayswar V. et al.: The Genetics of Autoimmune Thyroid Disease. J. Clin Endocrinol Metab 87: 5385. 2002

GRAVES DISEASE (M. BASEDOWII)

Incidence in Vorarlberg: 0.24 %
GRAVES DISEASE (M. BASEDOWII)

Vorarlberg, 1990 – 2002, n = 1019

\[ \tilde{x} = 46 \text{ a, 6 – 94 a} \]
PATHOGENESIS OF GRAVES DISEASE

GRAVES DISEASE (M. BASEDOWII)

TRIGGER
- Infections
- Stress
- Sexual Hormones
- Genetic Factors
GRAVES DISEASE (M. BASEDOWII)

CLINICAL SIGNS

- Tachycardie
- Ophthalmopathy
- Goiter
- Tremor
- Vitiligo
- Localized Myxedema
- Acropachy
GRAVES DISEASE ( M. BASEDOWII )

OPHTHALMOPATHY

Clinically evident: 10 – 25 %
Eyelid manifestations:  30 – 45 %
CT – manifestations:    70 %

GRAVES DISEASE (M. BASEDOWII)

OCCURRENCE OF OPHTHALMOPATHY

GRAVES DISEASE ( M. BASEDOWII )

LOCALIZED MYXEDEMA

Manifestations: 4 % of Patients with Graves Disease
3 % before Hyperthyroidism
65 % 0 – 2 a after Hyperthyroidism
22 % > 2 a after Hyperthyroidism

Combined with Ophthalmopathy: > 99 %

Pretibial Localisation: > 99 %

GRAVES DISEASE (M. BASEDOWII)

ACROPACHY

Manifestations: 7% of all Patients with localized Myxedema
Combination: with Ophthalmopathy and localized Myxedema 100%
Proportion: Male / Female: 1 : 1 (!!)

Italo SVEVO:

Zeno Cosini
GRAVES DISEASE (M. BASEDOWII)

• Radioiodine
• Surgery
• Antithyroid Drugs
TREATMENT OF OPHTHALMOPATHY

• Wait and see
• Prophylactic after 131 Radioiodine
• Corticosteroids
• Radiation
• Operation
THYROID AUTONOMY

• MANIFESTATIONS
  • Autonomous Adenoma
  • Multifocal Autonomy
  • Disseminated Autonomy
PATHOGENESIS OF THYROID AUTONOMY

- Somatic Mutation des TSH Receptors
  - Russo et al. 9% (J Clin Endocrinol Metab 1995)
  - Takeshita et al 2% (J Clin Endocrinol Metab 1995)

- Punctual Mutation gsp Oncogen (Activation of Gsα Protein)
  - Russo et al 24% (J Clin Endocrinol Metab 1995)
  - O’Sullivan et al 38% (Molecular Carcinogenesis 1991)
INCIDENCE OF AUTONOMY
PER 100,000 RESIDENTS IN VORARLBERG (1995)

- Autonomous Nodule: 66 (65%)
- Multifocal Autonomy: 34 (33%)
- Disseminated Autonomy: 2 (2%)

Total: 102
INCIDENCE OF AUTONOMY
PER 100,000 RESIDENTS IN VORARLBERG (1995)

Hyperthyroidism: 21 (21%)
Subclinical Hyperthyroidism: 35 (34%)
Euthyroidism: 46 (45%)

Autonomy Total: 102
INZIPIENTE UND MANIFESTE HYPERTHYREOSEN MIT AUTONOMIE
1995 / 96

N

100
80
60
40
20
0

Jahre

bis 30  30-40  40-50  50-60  60-70  gr. 70

manifest
inzipient
COURSE OF AUTONOMY IN THE THYROID GLAND

Hormone secretion by normal follicles

Hormone secretion by autonomous follicles

Thyroid gland

I  II  III  IV  V

Euthyroid state

Thyrotoxicosis
THYROID AUTONOMY
VERIFICATION

Thyroid Szintigraphy during TSH Suppression (TSH < 0.03 µU/ml)

Suppresion: Endogen and Exogen
**THYROID AUTONOMY THERAPY**

- AUTONOMY AND HYPERTHYROIDISM
  - RADIOIODINE
    - First line Treatment
    - Limited Operability
  - THYROIDECTOMY
    - Large Goiters ( > 80 ml )
    - Trachea - Compression ( > 50 % )
- ANTITHYROID DRUGS
  - Only for pretreatment for Radioiodine Therapy or Thyroidectomy
THYROID AUTONOMY THERAPY

- AUTONOMY AND SUBCLINICAL HYPERTHYROIDISM
  - RADIOIODINE
    - First line Treatment
    - Limited Operability
  - THYROIDECTOMY
    - Large Goiters (> 80 ml)
    - Trachea - Compression (> 50 %)
  - ANTITHYROID DRUGS
    - Only for pretreatment for Radioiodine Therapy or Thyroidectomy
THYROID AUTONOMY THERAPY

- AUTONOMY AND EUTHYROIDISIM

  - Follow Up (Ultrasound, TSH, FT3, FT4)
  - No Iodine Excess
  - Rare Indication for Radioiodine Therapy
  - Surgery
THERAPY OF AUTONOMOUS NODULES

Percutanous US – guided Alcohol Injection*

- **INDICATION**
  - Singel Nodule
  - Small Volume

- **METHOD**
  - Outpatient performance
  - 1 - 5 ml 95 % Alcohol intranodular
  - US - guided
  - Repeated applications necessary

* Papini E. et al., Thyroid 5: 147 -150, 1995
THERAPY OF AUTONOMOUS NODULES

Percutaneous US – guided Alcohol Injection*

• **SIDE EFFECTS**
  - Local pain, persistent
  - Hoarseness

• **RESULTS**
  - Normalisation of TSH 64 - 85 %
  - Recurrence 2.5 - 5 %

* Papini E. et al., Thyroid 5: 147 -150, 1995
<table>
<thead>
<tr>
<th>Author</th>
<th>N</th>
<th>Therapy-Failure</th>
<th>Dose mCi 131 Iodine</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heinze (1975)</td>
<td>188</td>
<td>9 %</td>
<td>18.9 ± 9.6</td>
<td>2.5 a</td>
</tr>
<tr>
<td>Mariotti (1986)</td>
<td>138</td>
<td>15 %</td>
<td>12.6 ± 4.1</td>
<td>1 – 11 a</td>
</tr>
<tr>
<td>Ratcliffe (1986)</td>
<td>48</td>
<td>15 %</td>
<td>15</td>
<td>2 – 10 a</td>
</tr>
<tr>
<td>Huysmans (1991)</td>
<td>52</td>
<td>2 %</td>
<td>20</td>
<td>4 – 17.4 a</td>
</tr>
</tbody>
</table>
SYMPTOMS IN HYPERTHYROIDISM

• HEART/ LUNG
  • Atrial Fibrillation
  • Angina
  • Palpitaion
  • Tachycardia
  • Hypertension
  • Cardiac Decompensation
SYMPTOMS IN HYPERTHYROIDISM

• INTESTINE
  • Diarrhea
  • Polyphagia
  • Constipation
  • Anorexia
SYMPTOMS IN HYPERTHYROIDISM

• NEUROLOGY/PSYCHIATRY
  • Tremor
  • Nervousness
  • Apathy
  • Depression
  • Loss of Libido

• METABOLISM
  • Loss of weight
  • Sweating
  • Heat Intolerance
THERAPY HYPERTHYROIDISM

• Radioiodine
• Thyroidectomy
• Antithyroid Drugs
THERAPY WITH 131 IODINE

ADVANTAGES
- Effective
- Cost – effective
- Safe

DISADVANTAGES
- Hypothyroidism
- Ophthalmopathy
- Radiation Protection
- Radiation Burden
THERAPY WITH 131 IODINE

CONTRA-INDICATIONS:

- Pregnancy
- Breastfeeding
- Patients < 20 Years
THERAPY WITH 131 IODINE

- Graves Disease
- Autonomy of the Thyroid
- Reduction of Thyroid Volume
# THERAPY WITH 131 IODINE

<table>
<thead>
<tr>
<th>Disease</th>
<th>Dose / Gy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graves Disease ablative functional – optimised</td>
<td>300, 200</td>
</tr>
<tr>
<td>Unifocal Autonomy</td>
<td>300 - 400</td>
</tr>
<tr>
<td>Multifocal Autonomy</td>
<td>150 - 200</td>
</tr>
</tbody>
</table>
THERAPY WITH 131 IODINE
CALCULATION OF DOSE*

Activity (MBq) = \frac{\text{Dose (Gy)} \times \text{Volume (ml)} \times k}{\text{max Uptake} \times H_{\text{L eff}} (d)}

3.7 GBq x d

K = \frac{3.7 \text{ GBq} \times d}{149 \text{ Gy} \times \text{ml}}

*Marinelli LD. Et al.: Dosage determination with radioactive isotopes.
HYPOTHYROIDISM AFTER RADIOIODINE THERAPY

![Graph showing cumulative probability over years for different groups.](image)
THERAPY WITH 131 IODINE

NOT RECOMMENDED

• Fixed Dose
• Fractionated Dose
THERAPY WITH 131 IODINE CORTISONE MEDICATION*

**OPHTHALMOPATHY**
- 0.4 – 0.5 mg Prednisolon/ kg BW / day
- 4 – 6 weeks

**PROPHYLACTIC**
- 0.4 – 0.5 mg Prednisolon/ kg BW / 2nd day
- 4 – 6 weeks

THERAPY WITH 131 IODINE
PRETREATMENT WITH ANTITHYROID DRUGS

• No effect when pretreatment is stopped with radioiodine therapy.*

• Therapy failure when pretreatment with antithyroid drugs is continued with radioiodine therapy.**


**SABRI O. et al.: Radiiodine therapy in Graves‘ disease patients with large diffuse goiters treated with or without carbimazole at the time of radiiodine therapy. Thyroid 9: 1181 – 1188 (1999)
THEARPY WITH THYROID ANTITHYROID DRUGS

• METHIMAZOL
  • Initial Treatment  40 – 60 mg
  • Long – term Treatment  5 – 10 mg

• CARBIMAZOL
  • Initial Treatment  30 – 40 mg
  • Long – term Treatment  5 mg

• PROPYLTIURAZIL
  • Initial Treatment  60 – 60 mg
  • Long – term Treatment  20 mg
## Side Reactions of Methimazol

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Percentage</th>
<th>Reaction</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exanthema</td>
<td>5.5%</td>
<td>Vertigo</td>
<td>0.4%</td>
</tr>
<tr>
<td>Effluvium</td>
<td>4.1%</td>
<td>Fever</td>
<td>0.3%</td>
</tr>
<tr>
<td>Arthropathia</td>
<td>1.6%</td>
<td>Dysgeusia</td>
<td>0.3%</td>
</tr>
<tr>
<td>Gastric Reaction</td>
<td>0.9%</td>
<td>Thrombopenia</td>
<td>0.2%</td>
</tr>
<tr>
<td>Liver Damage</td>
<td>0.8%</td>
<td>Agranulocytosis</td>
<td>0.14%</td>
</tr>
<tr>
<td>Neuropathia</td>
<td>0.7%</td>
<td>Pancytopenia</td>
<td>0.07%</td>
</tr>
<tr>
<td>Edema</td>
<td>0.7%</td>
<td>Dysosmia</td>
<td>0.07%</td>
</tr>
<tr>
<td>Leukopenia</td>
<td>0.4%</td>
<td>Vasculitis</td>
<td>0.07%</td>
</tr>
</tbody>
</table>
HYPOTHYROIDISM

• Immunogenic Hypothyroidism (Myxedema, Immunthyroiditidis)
• Thyroiditis de Quervain
• After Thyroidectomy
• After 131 Iodine Therapy
• After Radiation
• After Iodine Excess
• Pituitary Hypothyroidism
SYMPTOMS IN HYPOTHYROIDISM

• HEART/ LUNG
  • Bradycardia
  • Cardiac Decompensation
  • Hydropericarditis
  • Hypertension
SYMPTOMS IN HYPOTHYROIDISM

• METABOLISM
  • Increase of weight
  • Loss of weight

• MUSCULATURE/SKELETON
  • Hyposthenia, Hypodynamia
  • Carpal-canal Syndrome
SYMPTOMS IN HYPOTHYROIDISM

- NEUROLOGY/ PSYCHIATRY
  - Depression
  - Dementia
  - Paranoia
  - Psychosis
  - Deafness
  - Ataxia
  - Vertigo
  - Neuropathy
  - Myxedematous Coma
SYMPTOMS IN HYPOTHYROIDISM

• INTESTINE
  • Constipation
  • Atrophic Gastritis
  • Pernicious Anemia
SUBCLINICAL HYPOTHYROIDISM

• Normal T4
• Normal T3
• Normal or elevated basal TSH
• Abnormal TRH - Test
SUBCLINICAL HYPOTHYROIDISM
PROGNOSTIC VALUE

• Normal in adolescence
• With Thyroid antibodies
  • > 65 years → Hypothyroidism 80%
  • < 30 years → Hypothyroidism 5%
• After Therapy with I 131 → Hypothyroidism
PHARMACOLOGY OF THYROXINE

- Industrial Synthesis
- Gastro - Intestinal Resorption 80 %
- Serum Peak 2 – 4 hr after oral Medication
- Increase of Serum Level 10 – 15 %
- Persistent Serum Level 6 hr
- Half – Life 7 days
PHARMACOLOGY OF TRIIODOTHYRONINE

• Rapid Gastro - Intestinal Resorption 100 %
• Serum - Peak 2 - 4 hrs after oral Medication
• Considerable Increase of Serum - Concentrations
• Elevated Serum - Concentrations 6 – 8 hrs
• Half - Life approximately 1 day
## Replacement Therapy with Thyroxin

<table>
<thead>
<tr>
<th>Age</th>
<th>Thyroxin/kg BW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants</td>
<td>10 – 15 µg</td>
</tr>
<tr>
<td>Adolescents</td>
<td>&gt; 2 µg</td>
</tr>
<tr>
<td>Adults</td>
<td>1 – 2 µg</td>
</tr>
</tbody>
</table>
MONITORING THYROXINE REPLACEMENT THERAPY

TSH

0.1 – 4.5 µU/ml
THYROID HORMONES IN OLD AGE

- T4 and T3 Synthesis ↓
- T4 and T3 Clearance ↓
- T4 T3 Conversion ↓
- T3 in Serum ↓
- TSH Response to TRH ↓
CLASSIFICATION OF THYROIDITIS

1. Acute Thyroiditis
   1.1. Bacterial Thyroiditis
   1.2. Fungal/Parasitic Thyroiditis
   1.3. Aseptic Thyroiditis

2. Acute – Subacute Thyroiditis de QUERVAIN

3. Chronic Thyroiditis
   3.1 Immunthyroiditis
      3.1.1 Hashimoto Thyroiditis
      3.1.2 Atrophic Thyroiditis
      3.1.3 Postpartum Thyreoiditis
   3.2 invasive sclerosing Thyroiditis ( RIEDL )
   3.3 Specific Thyroiditis ( Tb, Sarcoidosis )
THYREOIDITIS de QUERVAIN

• CLINICAL SYMPTOMS
  • Extreme painful in middle and low cervical region
  • One side / both sides
  • Transmission to ears and angle of mandible
  • Malaise, Discomfort (for weeks and months)
  • Fever
  • Sweating
THYREOIDITIS de QUERVAIN
PATHOGENESIS

• Viral Infection ?
• (acute Autoimmune Disease ?)
THYROIDITIS de QUERVAIN OCCURANCE

THYREOIDITIS de QUERVAIN

• CLINICAL PRESENTATION
  • Tender goiter (diffuse, nodular)
  • Extremely painful

• LABAROTORY FINDINGS
  • High BSR
  • Hypoechoic regions in Ultrasound
  • No radionuclide Uptake
  • TG elevated
  • Eu-/ Hyper-/ Hypothyroidism
### Laboratory data at diagnosis for 94 patients with SAT

<table>
<thead>
<tr>
<th>Laboratory test</th>
<th>n</th>
<th>Reference range</th>
<th>Mean ± SD</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total T&lt;sub&gt;4&lt;/sub&gt; (µg/dl)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>78</td>
<td>5.0–12.5</td>
<td>12.1 ± 43</td>
<td>11.1</td>
</tr>
<tr>
<td>Free T&lt;sub&gt;4&lt;/sub&gt; (ng/dl)&lt;sup&gt;2&lt;/sup&gt;</td>
<td>20</td>
<td>0.8–1.8</td>
<td>2.8 ± 2.0</td>
<td>2</td>
</tr>
<tr>
<td>Total triiodothyronine (ng/dl)&lt;sup&gt;3&lt;/sup&gt;</td>
<td>10</td>
<td>80–180</td>
<td>180 ± 75</td>
<td>134</td>
</tr>
<tr>
<td>TSH (mIU/ml)&lt;sup&gt;4&lt;/sup&gt;</td>
<td>44</td>
<td>0.30–5.0</td>
<td>0.9 ± 1.6&lt;sup&gt;5&lt;/sup&gt;</td>
<td>0.05</td>
</tr>
<tr>
<td>Thyroglobulin (ng/ml)&lt;sup&gt;6&lt;/sup&gt;</td>
<td>5</td>
<td>≤59.4</td>
<td>383 ± 295</td>
<td>271</td>
</tr>
<tr>
<td>Erythrocyte sedimentation rate (mm/h)</td>
<td>53</td>
<td>0–22 (male)</td>
<td>51 ± 26</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0–29 (female)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uptake of iodine 131 (%)</td>
<td>79</td>
<td>8–29</td>
<td>3.2 ± 3.5</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Corticosteroids
  - 50mg Prednisolone / day with lowering the dose in 4 weeks

Non steroidal antirheumatic drugs
  - Diclofenac 2 - 3 x 50 mg / day for 4 weeks

L – Thyroxin
  - If patient is hypothyroid
<table>
<thead>
<tr>
<th>Therapy</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSAIDs alone</td>
<td>39 41</td>
</tr>
<tr>
<td>NSAIDs alone or NSAIDs+ corticosteroids</td>
<td>57 61</td>
</tr>
<tr>
<td>Corticosteroids alone</td>
<td>15 16</td>
</tr>
<tr>
<td>Corticosteroids alone or with other therapy</td>
<td>34 36</td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>21 22</td>
</tr>
<tr>
<td>Thyroidectomy</td>
<td>1 1</td>
</tr>
</tbody>
</table>
### Table 3. Outcome among 94 patients with SAT\(^1\) (No Cancer, no Graves Disease, no Ophthalmopathy)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early recurrence(^2) (Within 6 – 12 months)</td>
<td>10</td>
</tr>
<tr>
<td>Early hypothyroidism(^2)</td>
<td>34</td>
</tr>
<tr>
<td>Late recurrence(^3) (after 1 year)</td>
<td>4</td>
</tr>
<tr>
<td>Late hypothyroidism(^3)</td>
<td>15</td>
</tr>
<tr>
<td>Nodular goiter</td>
<td>5</td>
</tr>
<tr>
<td>Associated autoimmune disease</td>
<td>5</td>
</tr>
<tr>
<td>Malignancy</td>
<td>11</td>
</tr>
</tbody>
</table>

COURSE OF THYREOIDITIS de QUERVAIN

Graph showing the changes in T₄ and T₃ levels over time, with phases of thyrotoxic, euthyroid, hypothyroid, and recovery. The graph also includes TSH levels and I¹³¹ uptake 24 hr, along with TRH test and normal range markers.
„SILENT“/„PAINLESS“ THYROIDITIS

• CLINICAL SYMPTOMS (poor)
  • Fatigue
  • Nervousness
  • Adynamia
  • Tachycardia
  • Heat Intolerance
  • Sweating
  • Weight loss
SILENT“/„PAINLESS“  THYROIDITIS

• CLINICAL PRESENTATION
  – Tender Goiter (diffuse, nodular)

• LABORATORY FINDINGS
  • Moderate elevated BSR
  • Hypoechoic regions in Ultrasound
  • No radionuclide Uptake
  • TG elevated
  • Eu-/ Hyper-/ Hypothyroidism
"SILENT"/"PAINLESS" THYROIDITIS TREATMENT

- No special Treatment
- Hyperthyroid Phase: Propanolol
- Hypothyroid Phase: L-Thyroxin
POSTPARTUM THYROIDITIS

PRESENTATION* (13 Studies, 371 Patients)

Hypothyroidism 43 %
Hyperthyroidism 32 %
Hyperthyroidism followed by
Hypothyroidism 25 %

POSTPARTUM THYROIDITIS

HYPOTHYROIDISM
- Occurrence 2 – 12 months pp
- Peak 6 month
- Decreased energy
- Poor memory
- Dry skin
- Impaired concentration
- Postpartum depression
- Permanent Hypothyroidism 23 – 29 %

HYPERTHYROIDISM
- Occurrence 2 – 10 months pp
- Peak 4 month
- Asymptomatic 33 %
- Resolves spontaneously 2- 3 months
- DD Graves disease ( TRAK + 25 % )
- Palpitation
- Fatigue
- Irritability/Nervousness
- Heat intolerance
- Postpartum depression
POSTPARTUM THYROIDITIS TREATMENT

• HYPOTHYROIDISM
  • Treatment in 13 – 73 %
    ( mean 34 % ) *
  • L - thyroxine therapy

• HYPERTHYROIDISM
  • based on symptoms severity ( Propanolol )
  • No antithyroid drugs

AUTOIMMUNE – THYROIDITIS

CLINICAL SYMPTOMS

• THYROIDITIS HASHIMOTO
  • Goiter, Asymptomatic
  • Pains very rare
  • Symptoms of Hyperthyroidism
  • Hypothyroidism

• ATROPHIC THYROIDITIS
  • Symptoms of Hypothyroidism
AUTOIMMUNE – THYROIDITIS

LABORATORY FINDINGS

• THYROIDITIS HASHIMOTO
  • Hypoechoic Goiter
  • Normal Radionuclide Uptake
  • TPO – Antibodies 90 %
  • Eu-/ Hyper-/ Hypothyroidism

• ATROPHIC THYROIDITIS
  • Hypoechoic small Thyroid
  • Normal Radionuclide Uptake
  • TPO – Antibodies 90 %
  • Hypothyroidism
SCINTIGRAMM IN THYROIDITIS

- Normal/ Inhomogenous Radionuclide Uptake
  - Autoimmune Thyroiditis

- No Radionuclide Uptake
  - Thyroiditis de Quervain
  - „Silent“ Thyroiditis
  - Postpartum Thyroiditis
  - Thyroiditis after Amiodarone
SPORADIC NONTOXIC GOITER

- diffus
- uninodular
- multinodular
INCIDENCE OF THYROID NODULES *

• Palpable Nodules
  • Framingham Study 4,2 % (6,4 % ♀, 1,5 % ♂)
  • Whickham Study 3,2 %

• Nonpalpable Nodules
  • Autopsy (1955) 50,5 %
  • Ultrasound 7,5 MHz 42 %
  • Ultrasound 10,0 MHz 67 %

CAUSES OF SPORADIC NONTOXIC GOITER

- Autoimmune Factors
- Genetic Factors
- Extrinsic Factors
CHARACTERISTICS OF SPORADIC NONTOXIC GOITER

• Average Growth Rate $\sim 4.5\% \text{ / year}$
• Growth Rate variable
• Frequency to form Autonomous Nodules $\sim 10\%$ in 10 Years
• Risk for Thyroid Cancer $\sim 5\%$
• Difficult Prediction for Treatment
EVALUATION OF SPORADIC NONTOXIC GOITER

- Case History
- Ultrasound
- 99m Tc Scan & Uptake
- Fine Needle Aspiration Biopsy
- TSH
RISK OF MALIGNANCY IN NONPALPABLE THYROID NODULES


402 Patients

Cancer detected:

- Solitary nodules 9,2 %
- Multinodular Goiter 6,5 %
- \(< / > 10 \text{ mm Size} \) 7,0 % vs 9,1 %
- Extracapsular Growth in Cancer Patients 35,5 %
- Nodal Involvement in Cancer Patients 19,4 %
• Ultrasound Signs
  • Hypoechoic Appearance  87 %
  • Irregular or Blurred Margins  77,4 %
  • Intranodular Vascular Pattern  74,2 %
  • Microcalcification  29 %
TREATMENT GOALS OF SPORADIC NONTOXIC GOITER

• Relief of local compressive Symptoms
• Relief of cosmetic Deformity
• Prevention of progressive Thyroid Enlargement
• Treatment of Thyroid Function
TREATMENT OPTIONS FOR SPORADIC NONTOXIC GOITER

- Monitoring without Treatment
- L – Thyroxine Suppression
- Surgery
- 131 Iodine
SPORADIC NONTOXIC GOITER
MONITORING WITHOUT TREATMENT

• Clinical Examination
• Periodic Ultrasound Measurements
• Periodic Thyroid Function Tests
SPORADIC NONTOXIC GOITER

L – THYROXINE TREATMENT

• PRO’S
  • Suppression of TSH
  • Prevention of Growth*

• CON’S
  • Indefinite Treatment
  • Side Effects
  • Disappointing Placebo - Controlled Studies

MONITORING THERAPY OF SPORADIC NONTOXIC GOITER WITH L-THYROXINE

\[ \text{TSH} = 0.1 - 0.3 \, \mu\text{U/ ml} \]
EFFECTIVENESS OF THYROID HORMONE SUPPRESSION THERAPY IN BENIGN SOLITARY NODULES: A META ANALYSIS:


- Including Criteria:
  - Randomized Clinical Trial
  - With or Without Placebo
  - Single Thyroid Nodule
  - Benign proven by FNB
  - Measurement of Thyroid Volume by Ultrasound
  - Documented TSH Suppression
  - Duration of Treatment and Follow Up at least 6 Month
EFFECTIVENESS OF TRHYROID HORMONE SUPPRESSION THERAPY IN BENIGN SOLITARY NODULES: A META ANALYSIS:


6 STUDIES, 346 PATIENTS

• Suppressive hormone therapy is associated with a trend towards a reduction of more than 50% of benign thyroid nodules without achieving statistical significance

• The results are highly sensitive to changes in the statistical analysis especially if the method used ignores heterogeneity among the effect sizes

**L – Thyroxine**
- 1.9 μg/kg/day
- 43 % Responders
- Volume Decrease
  - 22/23 % after 1/2 Years
- Outcome directly related to TSH

**131 Iodine**
- 120 μCi/ml
- 97 % Responders
- Volume Decrease
  - 39/43 % after 1/2 Years
- Outcome inversely related to Goiter Size
SPORADIC NONTOXIC GOITER

L – THYROXINE TREATMENT

SIDE EFFECTS *

• Increase of Bone Turnover Markers
• Decrement in Bone Mineral Density 3.6% in 2 years
• Mild Thyrotoxicosis (34%)
• Atrial Fibrillation (3%)

SPORADIC NONTOXIC GOITER TREATMENT WITH 131 IODINE

SIDE EFFECTS *
- Neck Tenderness 12 %
- Slight Thyrotoxic Symptoms 12 %
- Hypothyroidism 35 %
- Hyperthyroidism 10 %

SPORADIC NONTOXIC GOITER
THYROIDECTOMY

- Size of Goiter
- Symptoms
- Age
- Surgical Expertise
SPORADIC NONTOXIC GOITER TREATMENT WITH 131 IODINE

• PRO´S
  • Effective Therapy (Size Decrease ~ 40 %)*
  • Mild Side Effects
  • Asthenic Patients

• CON´S
  • Hyperthyroidism
  • Hypothyroidism
  • Risk of Cancer
  • Compressive Symptoms During Therapy

SPORADIC NONTOXIC GOITER
TREATMENT WITH 131 IODINE
AFTER THYROGEN® *

• 0,01 / 0,03 mg Thyrogen®
• Increase of 131 Iodine Uptake
• Increase of Thyroid Hormone Levels

INDICATIONS FOR TREATMENT AFTER THYROIDECTOMY

• Recurrent Goiter
• Hypothyroidism (subclinical)
• Nodule(s) in Residues
• High Tg
IODINE DEMAND

150 µg / day
IODINE EXCESS

> 500 µg / day
TREATMENT OF IODINE INDUCED THYROTOXICOSIS

2 x 20 mg Methimazol
2 x 20 gtt Na Perchlorate
http://www.lkhf.at

ABTEILUNGEN / NUKLEARMEDIZIN