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Iodine Therapy in Switzerland

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Main topics

- Iodine therapy
- Audit of the regulatory body
- DVD in nuclear medicine
- Out-patient therapy in Switzerland
- Limit for release of patient in Switzerland
- Radioactive waste and patient release
- Question to ERPAN members



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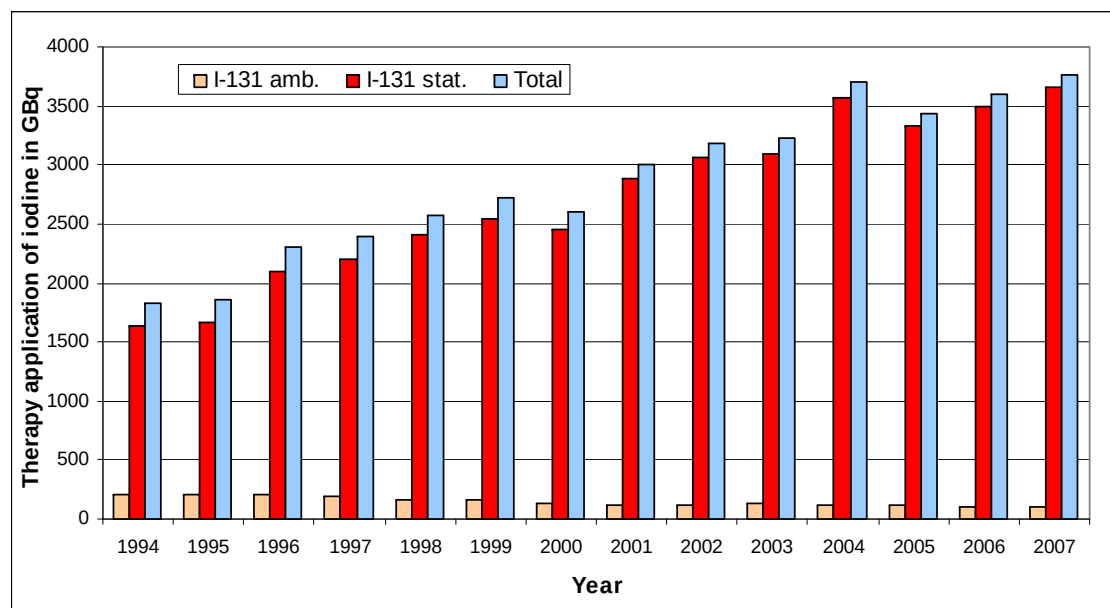
Iodine therapy

- Therapy with I-131 for
 - Thyroid Cancer
 - Hyperthyroid function
 - Hypothyroid function
- Administered activity ranges from 150 MBq to 7 GBq
- In- or out-patient therapy depending on activity administered





Iodine therapy in Switzerland



- 30 centres in Switzerland audited since 2007
- Audits are used to: analyse situation, indentify problems, issue recommendations



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Iodine therapy: audit focus

- Safe handling of radionuclides
 - storage
 - dispensing
 - transfer within the hospital
 - radioactive waste
- Safe administration
 - Patient condition (level of fitness)
 - Care required
 - Therapy possible?





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Audit focus

- Patient dosimetry
- Patient preparation
- The radioactive patient and dose constraints
- The hospitalized patient
 - instructions to nursing/cleaning staff
 - visitors instructions
 - patient release
 - decommissioning of hospital ward
 - radioactive waste
- Emergency procedures

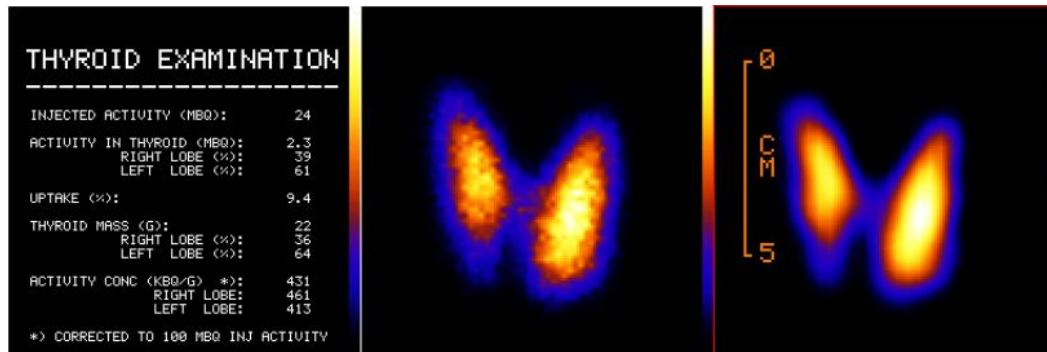




Dosimetry before Iodine therapy

Dosimetry is mandatory before treatment and the activity to be administered should be determined.

Example of method to calculate administered activity.



Thyroid mass (g) 30
Prescribed dose (Gy) 100

Uptake measurements				
Time (h)	Standard (cpm)	Patient (cpm)	Bg (cpm)	Uptake (%)
0	-	-	-	73,5
2	21736	5521	100	25,1
24	18286	12338	100	67,3
48	17165	10565	100	61,3
144	13171	5754	100	43,3

Activity to administer (MBq) =

$$\frac{23.4 * \text{mass(g)} * \text{dose (Gy)}}{\text{uptake at t=0 (\%)} * T_{\text{eff}} \text{ (d)}} =$$

$$\frac{23.4 * 30 \text{ g} * 100 \text{ Gy}}{73.5 \% * 4.0 \text{ d}} =$$

240 MBq

Effective half-life (d): 4,0



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Audit results

- Dosimetry before therapy not done very often
- Training of medical personnel insufficient (high turn over)
- Release of patient, dose rate limit not respected, no patient care during week-end
- Monitoring of personnel leaving the room
- Insufficient screening measurements of staff
 - Monitors not calibrated correctly
 - Lack of knowledge to perform such measurements
 - Periodicity not respected
- Waste management not optimal
- Problem with water release and tank





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Audit results

Contamination of:

- food, dishes and plates
- bed sheets, pillow, etc
- air in the room: cannot be ruled out
 - ➔ Solution has to be found to avoid the spreading of contamination

Water system

- Dose rate around water tank collecting urine / shower water and around canalization can be high
- Release of contaminated water per week should be followed carefully
- When activities are above clearance levels, water should be stored for decay. Limit of 1/50 LE [Bq/l] per month. This limit takes into account the volume of water used by the hospital





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Audit results

Applied activity: 250 MBq
Therapy: hyperthyroid
Patient: Female age 31
Days in hospital: 2.5
Dose rate at 1 m (release): 5 uSv/h

Position	Information	Value CS (3Bq/cm2)	Remarque
1	Floor around bed	5	Contamination with urine
2	Bedside table	2	
3	Telephone	1	
4	pillow	1,5	
5	Chair	1	Contamination could not be removed
6	Floor before sink	2	
7	Sink, wash-stand	11	
8	Wash-stand siphon	3	
9	Towelling	2	
10	WC-bowl	3	
11	WC-floor	20	
12	Nurse calling-button	1	



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Lessons learnt from the audit

- **Working group established to develop recommendations**
 - Radioactive waste
 - Procedure for release of material
 - Release of patient
 - Try to reduce the number of incidents in Switzerland
- **Training of medical and cleaning staff**

Production of a DVD in nuclear medicine (French – German)





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Out-patient therapy in Switzerland

- In-patient Iodine therapy room: controlled area
- The radioprotection act sets the limit for out-patient iodine therapy < 200 MBq
- Activity up to 400 MBq can be administered with the consent of the regulatory body
- No fractionation over several months allowed (attempts to treat the patient as out-patient)





Release of patient after therapy

- Release of patient according to legislation
 - Dose rate of 5 microSv/h @ 1 meter
 - Dose rate gives a remaining activity present in body of 150 MBq
 - Patient can release radioactivity (urine, etc), which, when not diluted in canalization (diapers, etc.) can cause problem and has to be considered as radioactive waste
 - Risks for the family
 - Alarm at incineration centers
- Limit of radioactive waste in Switzerland for I-131
 - 100 LE (exemption limit per month): 50 kBq
 - 0.1 microSv/h @10 cm
 - 3 Bq/cm²





Release of patient after therapy

In Switzerland, patient released when dose rate 5 microSv/h @ 1 meter

Value to calculate the dose rate, assumption point source (conservative)

H10 (I-131) = 0.062 mSv/h/GBq @ 1 m

Activity limit (100) LE: **50 kBq**

Dose rate limit (@ 10 cm): **0.1 microSv/h**

Rest activity in body	Swiss legislation	HERCA proposition
Rest activity in body	150 MBq	800 MBq
10 % rest activity goes away per day (no dilution in WC water and canalization)	15 MBq	80 MBq
Dose rate point source	0.93 microSv/h	4.96 microSv/h
Factor over the dose rate limit of 0.1 microSv/h	9.3	49.6



Release of patient after therapy

- **Problem with radioactive waste**

2 to 3 incidents per year reported by incineration centres, doing measurements of waste to trace radioactivity (dose rate measurement (level 2 x background) (example of contaminated diapers, food, etc.)



- **Problem with the new HERCA values (800 MBq)** recommendation. Radioactive waste problem in Switzerland.
- **Interested on feedback** from other country about waste and kontamination of patient room.



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Question and discussion

Feedback from other country on

- Criterion for out-patient therapy
- Radioactive waste and patient release criteria not compatible
- Contaminations of food, dishes and plates, bed sheets, pillow, etc, patient objects (notebook, etc.)..
- Procedures for release of radioactive material
- Incident and alarm in incineration centers
- Screening measurement for personnel for iodine



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Thank you for your attention

