Study on the prevalence of thyroid disease in healthcare workers at the Hospital of Pisa in relation with occupational exposure to ionizing radiation

Alessandra Pistelli
Occupational Medicine
University Hospital of Pisa

Introduction

- Epidemiological and radiobiological studies in animals show the correlation between exposure to ionizing radiation and thyroid cancer.
- The ICRP (International Commission on Radiological Protection) puts thyroid on a level of radiosensitivity of 9 cases out of 10000 persons per Sievert, for people aged between 18 and 64 years.
- Workers may be occupationally exposed to low doses of ionizing radiation with a maximum exposure of 20 millisievert per year.

OBJECTIVE OF THE STUDY

The study was performed in order to investigate any difference in the prevalence of thyroid diseases between exposed and non exposed healthcare workers.

Materials and methods

- The study population is represented by healthcare workers who have worked at the University Hospital of Pisa and observed from January 2005 until December 2008.
- The population under investigation in this study was composed by 6658 persons (4377 F and 2281 M).
- Data were obtained from computerized medical records deriving from medical surveillance (periodic medical examination, blood tests, imaging studies).
- Each worker was investigated for the presence or absence of any thyroid disease (either malignant or benign and current or past disease) according to their classification as exposed or non exposed to ionizing radiation.

Materials and methods

- Exposed workers underwent specific tests, according to the medical surveillance, in order to investigate thyroid pathology (hormone assays and ultrasound).
- Non exposed workers were not directly checked.

- Among all types of thyroid diseases, a particular interest was placed on the cases of thyroid cancer:
  - Histotype classification,
  - Department,
  - Job,
  - Exposure period,
  - Effective dose (individual dosimetry recordings)

Results

Distribution of all thyroid diseases in healthcare workers

	Cases (%)	Controls (%)	Total (%)
Exposed	213 (**9,6%**)	2013 (90,4%)	2226 (100%)
Non-exposed	333 (**7,5%**)	4099 (92,5%)	4432 (100%)
Total	546 (**8,2%**)	6112 (91,8%)	6658 (100%)

OR = 1.30

CI (95%) = 1.09-1.55

Results

Distribution of thyroiditis

	Thyroiditis	No thyroiditis	Total
Exposed	79 (**3,5%**)	2147 (96,5%)	2226 (100%)
Non-exposed	108 (**2,4%**)	4325 (97,6%)	4432 (100%)
Total	187 (2,8%)	6472 (97,2%)	6658 (100%)

OR = 1.47

CI (95%) = 1.10-1.97

Distribution of benign thyroid noduls

	Nodular pathology	No nodular pathology	Total
Exposed	68 (**3,1%**)	2158 (96,9%)	2226 (100%)
Non-exposed	102 (**2,3%**)	4330 (97,7%)	4432 (100%)
Total	170 (2,6%)	6488 (97,4%)	6658 (100%)

OR = 1.34

CI (95%) = 0.98-1.83

Results

THYROID CANCER:	N° total cases (%)	N° cases in exposed (%)	N° cases in non exposed (%)
Papillary ca	29 **(78,38%)**	13 **(92,86%)**	16 **(69,56%)**
***Follicular* ca**	2 (5,41%)	0	2 (8,70%)
Medullary ca	1 (2,70%)	1 (7,14%)	0
Unspecified ca	5 (13,51%)	0	5 (21,74%)
Total	37 (100%)	14 (100%)	23 (100%)

OR = 1.21

CI (95%) = 0.62-2.36

Distribution of Papillary Thyroid Cancer

	Papillary ca	No Papillary ca	Total
Exposed	13 (**0,58**%)	2213 (99,42%)	2226 (100%)
Non exposed	16 (**0,36**%)	4416 (99,64%)	4432 (100%)
Total	29 (**0,44**%)	6629 (99,56%)	6658 (100%)

OR = 1.62

CI (95%) = 0.78-3.38

Analysis of the cases of Thyroid cancer

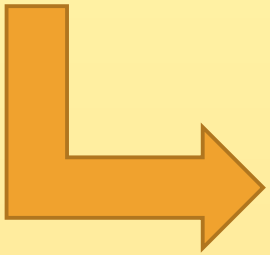
SEX	AGE PAT (yy)	DEPARTNMENT	JOB	YEARS OF EXPOSURE BEFORE PATOLOGY	EFFECTIVE DOSE FROM EXTERNAL IRRADIATION (mSv)	GLOBAL EFFECTIVE DOSE FROM EXTERNAL AND INTERNAL IRRADIATION (mSv)
F	40	Ophtalmology	Other operator	1	0	/
M	54	Heart surgery	Nurse	6	0	/
F	53	Ophtalmology	Other operator	3	0	/
M	53	Nuclear medicine	Nurse	11	**1,18**	**15,36**
F	50	General Surgery	Other operator	6	0	/
F	50	Heart surgery	Nurse	6*	0	/
F	51	Nuclear medicine	Nurse	1	**0,22**	**/**
F	30	Clinic physiology	Nurse	2	0	0
F	34	Radiotherapy	Doctor	2	0	/
F	22	General Surgery and Emergency	Nurse	<1	0	/
F	40	Radiotherapy	Radiographer	5	0	/
F	52	Heart surgery	Anaesthetist	16	**0,77**	**/**
M	40	Radiotherapy	Radiographer	4	0	/
M	47	Clinic physiology	Nuclear medicine specialist	2*	**1,31**	0

Dose zero means below detection limit

* Lack of data

Critical points

- Workers classified as exposed to ionizing radiation underwent specific test (hormone assays and ultrasound) to diagnose thyroid pathology, while other workers did not.



It causes an understimation of case in the category of non exposed workers.

- Classification of workers in exposed or non exposed categories based on the forecast of exposure rather than on a real exposure to ionizing radiation.

It can cause an overstimation of the risk

Conclusion

- A statistical association was found between thyroid disease and occupational exposure to ionizing radiation within a population of healthcare workers.
- Among all different kind of thyroid diseases, a statistical association was found only for thyroiditis.
- The methodological limits of this study don't allow to state that there is a correlation between exposure to ionizing radiation and thyroid diseases.
- Data collected and processed in this study lay the foundation for further investigations.