Knowledge and attitude regarding screening practices for pregnancy in female of childbearing age: a survey of a diagnostic radiology department.

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**Purpose**

In this poster we will review the survey on knowledge and attitude regarding screening practices for pregnancy in childbearing age in a radiology department, the 10Day Rule, 28Day Rule and the effects of ionizing radiation to pregnancy.

The aim is to analyze the knowledge and attitude of staffs in a diagnostic radiology department in screening females of childbearing age before radiological investigations involving ionizing radiations and subsequently improve our clinical practice.

Background:
The incidence of accidental prenatal exposure increased appreciably over the past years, owing to increased use of ionizing radiation radiological investigations.

At least one quarter of pregnant women have had a radiographic experience during the pregnancy, either for obstetrical reasons or in the course of medical and dental examinations [1].
Pre-conception irradiation of either parent's gonads has not been shown to result in increased cancer or malformations in their children. The non-cancer effects of ionizing radiation on the embryo or fetus depend on the radiation dose and the gestational age at the time of exposure. Effects of ionizing radiation on the embryo or fetus include, miscarriage, fetal growth restriction, congenital malformation (e.g. microcephaly), mental retardation, and increased risk for childhood cancer [2].

Radiation-induced non-cancer health effects are not detectable for fetal doses below about 50 mGy (1 mGy =100 mrad) [3]. Non-cancer health effects may be expected after fetal doses >=100mGy. Doses > 100mGy are not commonly reached with conventional x-ray examinations, but may be reached with fluoroscopic procedures (e.g. barium enema) and with radiotherapy (Table 1).

Table 1. Maximum Estimated Fetal Dose (mGy) During Some Common Diagnostic Imaging Studies.

<table>
<thead>
<tr>
<th>Study</th>
<th>View</th>
<th>Mean</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest [3]</td>
<td>AP</td>
<td>&lt;.01</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>CT Head* [4]</td>
<td></td>
<td></td>
<td>&lt; 0.50</td>
</tr>
<tr>
<td>Abdomen [3]</td>
<td>AP</td>
<td>2.90</td>
<td>15.00</td>
</tr>
<tr>
<td>CT Abdomen * [4]</td>
<td></td>
<td></td>
<td>26.00</td>
</tr>
<tr>
<td>Lumbar spine [3]</td>
<td>AP</td>
<td>7.50</td>
<td>40.00</td>
</tr>
<tr>
<td>Barium enema [3]</td>
<td></td>
<td>10.00</td>
<td>130.00</td>
</tr>
<tr>
<td>Iodine ((^{131})I), at fetal thyroid tissue at 20 weeks gestation [4]†</td>
<td></td>
<td></td>
<td>5900.00</td>
</tr>
</tbody>
</table>

* 10 slices with slice thickness = 10mm
† The use of radioactive isotopes of iodine is contraindicated in pregnancy

Prior to 2 weeks gestation an exposure of 100 mGy (10 rads) may lead to death of the embryo. The dose necessary to kill 100% of human embryos or fetuses before 18 weeks' gestation is about 5000 mGy (500 rads). Radiation-induced non-cancer health effects are unlikely at this stage of development no matter what the radiation dose. [3].
For fetuses exposed between 8-15 weeks' gestation atomic bomb survivor data indicate that the decline in IQ score is approximately 25-31 points per 1000 mGy above 100 mGy (40% risk for severe mental retardation) [5].

From 16- to 25 weeks' gestation the average IQ loss is approximately 13-21 points per 1000 mGy (per 100 rads) at doses above 700 mGy (70 rads) [3].

After 26 weeks, doses above 1000 mGy (100 rads) the risks for stillbirth and neonatal death (i.e., infant death within 28 days after birth, including stillbirth) increases [3].

There appears to be slightly increased risk of childhood cancer with radiation doses to the fetus of >= 10mGy (1000 mrad). There is no evidence that this effect is dependent on gestational age. The absolute risk for fatal cancer for ages 0-15 year after prenatal radiation exposure has been estimated to be 0.006% per 1 mGy. For the whole life span this risk is about 0.015% per 1 mGy. In other words there is over a 99% chance that a fetus exposed to less than 100mGy will NOT develop childhood cancer or leukemia.

In 1964, the National Health and Medical Research Council (NHMRC) recommended that "In women of childbearing age, non-urgent x-ray examinations that entailed pelvic irradiation should be restricted to the first ten days of the menstrual cycle." This practice is commonly known as the **10Day Rule**.

In 1984, the International Commission on Radiological Protection (ICRP) reported that there was little, if any, risk of damaging the foetus during the first two weeks of gestation i.e. before the first menstrual cycle was missed[6]. The National Radiological Protection Board (NRPB) issued advice based on this statement[7]. The College of Radiographers and Royal College of Radiologists followed up with their joint guidelines[8]. Before an examination of an area where the uterus is within or close to the irradiated area is conducted, the radiographers and the radiologists are required to ask the patient if there is any possibility that the patient may be pregnant. If the patient replies in the negative (NO) then the radiographers and the radiologists must ask the date of the patient's last period. If the menstrual cycle is overdue, then the examination may be postponed. This practice is commonly known as **28Day Rule**.
Methods and Materials

A self-administered questionnaire in English was given to the staffs. An immediate response was requested and the questionnaires were collected upon completion. In order to facilitate understanding of the questions and increase the response rate, a coordinator was present to help the respondents. All data collected was made anonymous, stored and controlled by the authors.

Sample of questionnaire distributed:

1. Have you heard of the 10Day Rule?
2. Define 10 Day Rule.
3. Have you heard of the 28Day Rule?
5. Do you think these rules will be of significant help in preventing accidental irradiation of fetus in our clinical practice?
Options: 1 - Not helpful. 2- May be helpful. 3- Very helpful.
Please justify your options.

Fig.1 Sample of questionnaire distributed.
Results

There were 72 respondents who participated in and completed the survey (92.3% response rate). The respondents were physicians (88%), non-physicians i.e. radiographers and nurses (93.8%). More than half (61.1%) were seniors, i.e. any staffs with 5 years or more working experience.

Table 1. Awareness of both Rules among the staffs. Total of 72 respondents.

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>10Day Rule</th>
<th>28Day Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes: 56 (78%)</td>
<td>Yes: 25 (34.7%)</td>
<td></td>
</tr>
<tr>
<td>No: 20 (22%)</td>
<td>No: 47 (65.3%)</td>
<td></td>
</tr>
</tbody>
</table>

Fig.: Awareness of Rules by Seniority

References: - Singapore/SG
Fig.: Awareness of Rules by Gender
References: - Singapore/SG

Fig.: Awareness of Rules by Professions
References: - Singapore/SG
Majority of the staffs were aware of the 10 Day Rule (78%) and but not 28 Day Rule (34.7%) as shown in Table 1.

A half of the senior staffs (81.8%) were aware of the 10 Day Rule, while only about a third (36.4%) of them were aware of the 28 Day Rule (Fig.1).

As shown in Fig.2, the proportion of male and female staffs that were aware of the 10 Day Rule was of not much difference (75% and 79% respectively). However, more male staffs (45%) were aware of the 28 Day Rule compared to female staffs (25.6%).

**Significance of the 10 Day Rule**

<table>
<thead>
<tr>
<th></th>
<th>Not Helpful</th>
<th>May Be Helpful</th>
<th>Very Helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>4.00%</td>
<td>24.00%</td>
<td>72.00%</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seniors</td>
<td>3.40%</td>
<td>48.30%</td>
<td>48.30%</td>
</tr>
<tr>
<td>Juniors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-physicians</td>
<td>2.90%</td>
<td>70.60%</td>
<td>26.50%</td>
</tr>
<tr>
<td>Physicians</td>
<td>31.30%</td>
<td>68.80%</td>
<td></td>
</tr>
</tbody>
</table>

**Fig.**: Significance of the 10 Day Rule

**References**: - Singapore/SG
A big proportion of the physicians (68.8%) opined that 10Day Rule is very useful while the other third were doubtful of its significance to our clinical practice. Most non-physicians (70.6%) opined that the 10Day Rule and 28Day Rule (88.2%) might be helpful in clinical practice.

Less than a third of the juniors opined that the 10Day Rule is very helpful while all (100%) doubted the significance of the 28Day Rule.

Interestingly, majority of the female staffs doubted the significance of both rule.

While majority of the males thought the 10Day Rule (72.0%) would be of significant help and doubted the significance of the 28Day Rule (64.0%).

Reasons cited by staffs who opined that both rule may be and not helpful for clinical practice.

- Patients may not have regular menstrual cycle.
• Patients may not remember/ be honest with their last menstrual period (LMP).
• Practicability in scheduling appointments.

The data was also entered into the Statistical Package for the Social Sciences (SPSS) version 12.0 (SPSS Inc, Chicago, IL, USA) and analysed. A comparison of the respondents' knowledge was made using the chi-square test. Logistic regression was performed to adjust for seniority groups, profession and gender. A p-value of < 0.05 was considered to be statistically significant.

The difference of knowledge between the genders, professions and seniority were statistically insignificant (p-value <0.05). This is mainly due to the limited number of respondents.

However, there were significant differences of opinions between the two group of professions regarding the significance of both rule to clinical practice (p-value 0.016, 0.000), between the two groups of seniority regarding the 28Day Rule (p-value 0.002) and between the genders in regards of the 10 Day Rule (p-value 0.000).

Fig. 7

Suggestions from staffs in prevention of radiation to fetus:
• Application of both rules to practice.
• To do urinary pregnancy test (UPT) or serum beta HCG to all female of childbearing age before any investigations that may involve dosage of >50 mGY.
• To re-enforce the practice of getting patient to wear lead gown over the pelvic area to reduce scattered radiation to the pelvic region.
Fig. 0: Awareness of Rules by Seniority

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Fig. 0: Awareness of Rules by Gender

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Fig. 0: Awareness of Rules by Gender

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Fig. 0: Awareness of Rules by Professions

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Fig. 0: Significance of the 10Day Rule

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Fig. 0: Significance of the 28Day Rule
Conclusion

This study shows that

- The staffs are generally supportive of safety precautions with regard to prevent radiating fetus accidentally.
- Most junior staffs are generally lacking in knowledge regarding Rules that help to prevent radiating fetus.
- Most female staffs found these Rules unreliable and doubt the significance to our practice.

The study suggests that all staffs should have more information and knowledge about effects of ionizing radiation to pregnancy to raise the awareness and subsequently be more prudent in clinical practice. Educational programs of such should be made available and perhaps mandatory for all staffs of radiology department.

Radiation safety in pregnancy should be part of departmental work processes and standard operating procedure (SOP), and perhaps one of radiology department's Key Performance Indicator (KPI).

Radiology department needs to nurture a culture of best practice and emphasise the important of radiation safety and pregnancy among staffs in this regard, when delivering quality care to the patients.
References

Reference:


7. National Radiological Protection Board. Exposure to ionising radiation of pregnant women: advice on the diagnostic exposure of women who are, or who may be pregnant. ASP8.NRPB, 1985.

Personal Information

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