MRI dedicated to bones and joints: What are their market shares in terms of number of patients in private practice in France?

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Abstract

Purpose: The French government plans to install MRI facilities dedicated to musculoskeletal indications. We have analyzed the use of imaging investigations in the community to assess their market share.

Materials and methods: We undertook a retrospective analysis of all reimbursements during the year 2012 by the French Social Plan for Independent Workers for 4 imaging methods for a musculoskeletal indication (MRI, CT scan with or without opacification and contrast-enhanced conventional radiography).

Results: Three hundred and thirty-two thousand eight hundred and ninety-three beneficiaries were included. The following investigations were used: MRI 12659 investigations; CT scan without direct opacification 7392; CT scan with direct opacification 1271; contrast-enhanced conventional radiography 1187. Of those beneficiaries who underwent investigations of the spine, 39.91% had MRI alone, 8.62% had both MRI and one of the other investigations and 51.46% did not have MRI. The corresponding figures for beneficiaries undergoing lower limb investigations were 79.57%, 4.53% and 15.90% and those for beneficiaries undergoing upper limb investigations were 35.49%, 6.56% and 57.94% respectively.

Conclusion: In terms of the numbers of investigations, our results show that in France MRI dedicated to musculoskeletal indications has a wide market share for the spine, upper and lower limbs.

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A classification of MR instruments depends on the regions examined. So called "multifunctional" or "whole body" instruments allow each anatomical region to be examined for a large number of medical indications. The "specialist osteoarticular" MR instruments have the same features as the multifunctional instruments although their use is reserved for osteoarticular investigations. MR instruments "dedicated to osteoarticular limb investigations" are instruments whose features are only consistent with osteoarticular investigations of the upper or lower limbs, excluding hip and shoulder.

Almost all of the approved instruments at the end of 2011 were "multifunctional" machines.

Both the government and the French National Health Insurance Fund for Employees (CNAMTS) approved the installation of additional osteoarticular (OA) MR from 2013 onwards (MR instruments dedicated to the limbs or specialized osteoarticular machines), firstly in order to reduce the use of computed tomography which exposes the population to the risk of ionizing irradiation (its contribution to the dose of irradiation delivered to the population from medical imaging has increased from 34% in 2000 to 47% in 2008) [1–12] and secondly to release places for the existing MR instruments, which, although they are "whole body" machines, are mostly used for limb and spine investigations (61% of MR investigations performed in the private sector were dedicated to investigation of the limbs and spine in 2009) [13–16]. France appears to differ from other countries, where fewer MR limb investigations are carried out [15]. Added to the fact that it has fewer instruments per inhabitant compared to its neighbours, the waiting times for whole body MR in oncology and neurology have increased (the waiting time for suspected metastasis of a colonic cancer was 30 days in 2013) [1, 13].

What will be the market shares of future OA dedicated MR in medical imaging in terms of the number of investigations? How will replacement of the investigations performed at present in these indications be broken down? In order to try to answer these questions, our study quantified the use of four categories of imaging investigations in OA situations in the general population in 2012: MR, CT with direct contrast medium cavity opacification, CT without direct contrast medium cavity opacification and radiography with direct contrast medium cavity opacification.

Materials and methods

The Social Plan for Independent Workers (RSI) requires mandatory affiliation from active, incapacitated or retired independent workers, the families for whom they are responsible and if they die, their surviving partner in receipt of a surviving partner’s pension. It reimburses care for over 3.5 million people or approximately 5% of the population of France and is the third largest mandatory French social protection system.

We carried out an electronic data extraction in June 2013 from the care reimbursement data for the private sector (private practices, private clinics and health centres). These data are populated every 15 days and have a history of over three years, and therefore contain all of the reimbursements for care in 2012. The inclusion criteria were all insured people and their dependents for the two independent workers RSI funds covering the Provence-Alpes Côte d’Azur (PACA) region (Départements 04, 05, 06, 13, 83 and 84) who applied for reimbursement of care delivered in 2012.

Imaging investigations

We extracted all of the procedures carried out in 2012 together with the date they were performed and the patient’s Social Security number which were invoiced with a French Common Medical Procedures Classification Code (CCAM) [17] representing medical fees for interpreting CT with direct contrast medium cavity opacification (CT with cavity opacification), CT without direct contrast medium cavity opacification (CT without cavity opacification), radiographs with direct contrast medium cavity opacification (CM radiographs) and MR (Tables 1 and 2) for the limbs or spine.

In the spine, direct contrast medium opacifications involved the intervertebral discs, posterior vertebral joints, spinal subarachnoid space, the nerve roots or terminal dural sac. In the limbs, they were for the joints. If a "CT without cavity opacification" and a "CM radiograph" were coded on the same day in the same anatomical territory, we only counted a single statistical unit for the two investigations and deemed that in reality this was "CT with cavity opacification" which had been invoiced with two CCAM codes (Table 1) as these scans are always performed during the short time lag when the contrast medium from the CM

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1 Decision of 20 March 2012 of the National union for Health Insurance Funds for the list of procedures and services reimbursed by the National Health Insurance Funds. JORF no. 0131 of 7 June 2012 page 9616 text no. 8. [http://www.legifrance.gouv.fr/affichTexteArticle.do?cidTexte=JORFTEXT0000025981799&dateTexte=20120607&categorieLien=cid](http://www.legifrance.gouv.fr/affichTexteArticle.do?cidTexte=JORFTEXT0000025981799&dateTexte=20120607&categorieLien=cid).


Approval of the amendment no. 4 to the national agreement governing the relationships between private doctors and the National Health Insurance Funds signed on 26 July 2011. JORF no. 0077 of 30 March 2012 page 5790 text no. 132. [http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000025593270](http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000025593270).

3 Ultrasound was not examined as this is not an irradiating investigation (one of the objectives of the new installations is to reduce patient exposure to ionising irradiation for radio-protection purposes) although the reader will be aware that future OA dedicated MR may also to some extent replace limb ultrasound and that ultrasound may already be reducing the use of irradiating investigations.

4 Inclusions into our study were from reimbursements for the intellectual interpretation of the images obtained. These were or could be linked to other reimbursements: contrast medium injection procedure (charged as a supplement for radiological contrast medium injection), the use of CT (remunerated by a technical payment) and therapeutic injection of pharmacologic agents (covered by specific CCAM codes).
Table 1 CT and CM radiographs by anatomical territory: codes, description and fees for the intellectual service of investigation interpretation according to the Joint Medical Procedures Classification (CCAM).

<table>
<thead>
<tr>
<th>Anatomical region</th>
<th>Technique</th>
<th>CCAM codes and description</th>
<th>CCAM tariff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower limb</td>
<td>CT with cavity opacification</td>
<td>NZQH002 lower limb arthrography with CT (lower limb CT arthrography)</td>
<td>93.10 €</td>
</tr>
<tr>
<td></td>
<td>CT without cavity opacification</td>
<td>NZQK002 unilateral or bilateral lower limb segment CT without contrast enhancement</td>
<td>25.27 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NZQH001 unilateral or bilateral lower limb segment CT with contrast enhancement</td>
<td>25.27 €</td>
</tr>
<tr>
<td></td>
<td>CM radiography</td>
<td>NHQH001 foot and/or toe arthrography</td>
<td>39.90 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NGQH001 ankle arthrography</td>
<td>57.19 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NFQH001 knee arthrography</td>
<td>106.40 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NEQH002 hip arthrography</td>
<td>69.16 €</td>
</tr>
<tr>
<td>Upper limb</td>
<td>CT with cavity opacification</td>
<td>MZQH001 upper limb arthrography with CT (upper limb CT arthrography)</td>
<td>79.80 €</td>
</tr>
<tr>
<td></td>
<td>CT without cavity opacification</td>
<td>MZQK002 unilateral or bilateral upper limb segment CT without contrast enhancement</td>
<td>25.27 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MZQH002 unilateral or bilateral upper limb segment CT with contrast enhancement</td>
<td>25.27 €</td>
</tr>
<tr>
<td></td>
<td>CM radiography</td>
<td>MHQH001 metacarpophalangeal or interphalangeal arthrography of the finger</td>
<td>39.90 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MGQH001 wrist arthrography</td>
<td>69.16 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MFQH001 elbow arthrography</td>
<td>57.19 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MEQH001 shoulder arthrography</td>
<td>79.80 €</td>
</tr>
<tr>
<td>Spine</td>
<td>CT with cavity opacification</td>
<td>AFQH003 myelography of the vertebral column with CT (CT myelography)</td>
<td>106.40 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AFQH001 saccoradiculography with vertebral column CT</td>
<td>106.40 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LHQH005 single intervertebral percutaneous discography with vertebral column CT (disc CT)</td>
<td>106.40 €</td>
</tr>
<tr>
<td></td>
<td>CT without cavity opacification</td>
<td>LHQK001 CT of a vertebral column segment without contrast enhancement</td>
<td>25.27 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LHQH006 CT of a vertebral column segment with contrast enhancement</td>
<td>25.27 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LHQK005 several segments of the vertebral column without contrast enhancement.</td>
<td>25.27 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LHQH002 several segments of the vertebral column with contrast enhancement</td>
<td>25.27 €</td>
</tr>
<tr>
<td></td>
<td>CM radiography</td>
<td>AFQH002 saccoradiculography</td>
<td>106.40 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LHQH003 single percutaneous single intervertebral discography</td>
<td>106.40 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LHQH004 percutaneous multiple intervertebral discography</td>
<td>106.40 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AEQH002 cervical myelography</td>
<td>106.40 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AEQH001 thoracic and/or lumbar myelography</td>
<td>106.40 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LHQH001 posterior vertebral joint arthrography</td>
<td>46.55 €</td>
</tr>
</tbody>
</table>

a CM radiography = radiography with direct cavity opacification with contrast medium.

b "Contrast enhancement" means "vascular contrast enhancement".

Radiograph is still present, in order to improve the resulting contrast resolution. We were only able to identify this type of paired investigation because we had the patient identifier Social Security number and the date the procedures were performed, but a researcher without access to individual data would have been unable to specifically isolate investigations coded in this way (68% of CTs with direct cavity opacification in our study were coded this way, with two codes).

Each investigation was described using the following variables:
- category of investigation: MR, CT without cavity opacification; CT with cavity opacification and CM radiographs;
- the anatomical site examined: upper limb, lower limb and spine;
- the site of the cavity for CT with cavity opacification and CM radiographs: unspecified upper limb joint, shoulder, elbow, wrist, metacarpophalangeal or interphalangeal.
finger joints; unspecified lower limb joint, hip, knee, ankle, foot or toes; posterior vertebral joint; terminal dural sac and cauda equina; spinal cord excluding cauda equina and intervertebral disc. The category "unspecified lower limb joint" was only linked to limb CT with cavity opacification invoiced as a single code (i.e. "NZQH002 lower limb CT arthrography" or "MZQH001 upper limb CT arthrography") (Table 1). Conversely, the category was not linked to limb CT with cavity opacification which was invoiced with two CCAM codes, as the second code for conventional arthrography included the name of the joint concerned in its description (Table 1).

The annual number of investigations is expressed as the ratio of investigations to the number of people covered by the RSI.

**Patients**

Each patient was described by the following 2 variables (Table 3):

- anatomical site variable: patients who had more than one anatomical site from the group of lower limb, upper limb and spine during the year 2012 were allocated the value "Mixed" for the anatomical site variable;
- category of investigation variable: patients who had more than one category of imaging investigation from the group MR, CM radiograph, CT without cavity opacification and CT with cavity opacification during the year 2012 were allocated the value "Mixed" for the category of investigation variable.

For each separate anatomical site (subgroup analysis of all investigations including also, among others, those performed on patients with a mixed anatomical site variable), we then distinguished patients who had:

- MRI only, without other categories of investigations;
- one of the three categories of irradiating investigation alone without MR;
- those who had both MR and one of the three categories of irradiating investigation (Fig. 5).

**Ethics**

Agreement from the ethical research committee was not required as the people whose radiological investigations were studied were not asked to attend by the insurance fund and the study had no impact on their past or future reimbursements as the data were entirely anonymized before being sent for analysis to the research group.

For ethics purposes, the database study was approved by the CNIL (French Data Protection Authority) (dossier no. 342521, amendment 2) and the study protocol was approved by the in-house RSI committee responsible for the research.

**Results**

In a population of 332,893 people with RSI cover in 2012 (238,676 of whom were over 29 years old), 17,793 people (i.e. 5 people/100 beneficiary years) had at least one MR, CT without cavity opacification, CT with cavity opacification or CM radiography in the private sector in 2012 for limbs and/or spine (Table 3). Significantly, more people had MR for the lower limbs (difference from independence hypothesis = 1743), significantly more had CT with cavity opacification for the upper limbs (difference from the independence hypothesis = 450) and significantly more had CT without cavity opacification for the spine (difference from the independence hypothesis = 1674) (Table 3).
We identified a total of 22,509 investigations representing an average of 1.27 investigation/person who had one or more performed during the year, or 6.8 investigations/100 beneficiary years.

The distribution by type of investigation was as follows: MR (12,659; 56%; 38 investigations per 1000 beneficiary years), CT without cavity opacification (7392 investigations; 33%; 22 investigations per 1000 beneficiary years), CT with cavity opacification (1271 investigations; 6%; 4 investigations per 1000 beneficiary years) and CM radiographs (1187 investigations; 5%; 3.6 investigations per 1000 beneficiary years) (Fig. 1). The ratio of number of MR investigations/number of CT investigations (with or without cavity opacification) was 1.46.

The distribution of investigations by anatomical site was spine (11,154; 50%), lower limb (8410; 37%) and upper limb (2945; 13%) (Fig. 2).

The commonest spine investigations were CT without cavity opacification (51.46% of spine investigations) followed by MR (44.13%) (Fig. 3). For the spine, 61.59% of CTs with cavity opacification and CM radiographs were for the posterior vertebral joints (Fig. 4). The ratio of MR investigations/CT with or without cavity opacification was 0.82. The distribution of people who had these investigations (MR, CT, CM radiographs) was as follows: MR without the other two investigations in the year studied (3722 people; 39.91%), scan or CM radiograph without MR in the year studied (4799 people; 51.46%), both MR and one of the other two investigations in the year studied (804 people; 8.62%) (Fig. 5).

The most common lower limb investigation was MR (78.85% of lower limb investigations) followed by CT without cavity opacification (12.81%) (Fig. 3). For the lower limb, 40.60% of CTs with cavity opacification and CM radiographs

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**Table 3** Distribution of people in the population. The rows show the anatomical site studied in the year 2012 and columns show the category of imaging investigation used in the year 2012.

<table>
<thead>
<tr>
<th></th>
<th>MR</th>
<th>Mixed</th>
<th>CM radiography</th>
<th>CT without cavity opacification</th>
<th>CT with cavity opacification</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower limb</td>
<td>5075</td>
<td>282</td>
<td>156</td>
<td>647</td>
<td>107</td>
<td>6267</td>
</tr>
<tr>
<td></td>
<td>1743</td>
<td>−374</td>
<td>2</td>
<td>−1243</td>
<td>−129</td>
<td></td>
</tr>
<tr>
<td>Upper limb</td>
<td>720</td>
<td>180</td>
<td>210</td>
<td>402</td>
<td>527</td>
<td>2039</td>
</tr>
<tr>
<td></td>
<td>−364</td>
<td>−33</td>
<td>160</td>
<td>−213</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td>351</td>
<td>623</td>
<td>7</td>
<td>112</td>
<td>2</td>
<td>1095</td>
</tr>
<tr>
<td></td>
<td>−231</td>
<td>508</td>
<td>−20</td>
<td>−218</td>
<td>−39</td>
<td></td>
</tr>
<tr>
<td>Spine</td>
<td>3313</td>
<td>777</td>
<td>63</td>
<td>4204</td>
<td>35</td>
<td>8392</td>
</tr>
<tr>
<td></td>
<td>−1148</td>
<td>−101</td>
<td>−143</td>
<td>1674</td>
<td>−282</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9459</td>
<td>1862</td>
<td>436</td>
<td>5365</td>
<td>671</td>
<td>17793</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>DF</th>
<th>Value</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Squared</td>
<td>12</td>
<td>9668.9424</td>
<td>&lt; .0001</td>
</tr>
</tbody>
</table>

At the intersection of lines and columns, the upper figure represents the number of people who had at least one imaging investigation belonging to the category of imaging investigation for this anatomical site. People who had investigations for more than one of the anatomical sites, lower limb, upper limb and spine in the year are shown in the mixed row. People who had more than one category of imaging investigation, MR, CM radiograph, CT without cavity opacification and CT with cavity opacification in the year are shown in the mixed column. The same person can only therefore be in one cell only. The rows and columns are in attraction when a row is selected more than the average by a column: this can be identified by a positive distance from the independence hypothesis. When distance is from the independence hypothesis is negative, the rows and columns are in repulsion. It can be seen here that there is an attraction between MR and lower limb and an attraction between CT without cavity opacification and spine. Conversely, there is repulsion between CT without cavity opacification and lower limb and there is also a repulsion between MR and spine.

a Radiographies with direct cavity contrast opacification.
b Content of each cell: upper: observed data.
c Content of each cell: lower: distance from the independence hypothesis (observed data—expected value assuming independence).
were for the knee (Fig. 4). The ratio of MR investigations/CT with or without cavity opacification was 5.23. The distribution of people who had these investigations (MR, CT, CM radiographs) was as follows: MR without the other two investigations in the year studied (5670 people; 79.57%), CT or CM radiograph without MR in year studied (1133 people; 15.90%), both MR and one of the other two investigations in year studied (323 people; 4.53%) (Fig. 5).

The most common upper limb investigation was MR (37.56% of upper limb investigations) followed by CT with cavity opacification (27.81%) (Fig. 3). For the upper limb, 68.51% of CTs with cavity opacification and CM radiographs were for the shoulder (Fig. 4). The ratio of MR investigations/CT with or without cavity opacification was 0.79. The distribution of people who had these investigations (MR, CT, CM radiographs) was as follows: MR without the other two investigations in year studied (876 people; 35.49%), CT or CM radiograph without MR in year studied (1430 people; 57.94%), both MR and one of the other two investigations in the year studied (162 people; 6.56%) (Fig. 5).

All anatomical sites combined, the most common cavity opacification investigation was for the shoulder (41.46% of

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**Figure 2.** Total number (n = 22,509) of CT, MR and CM radiographs for the limbs and spine, performed in 2012 in the private sector (private practices, private clinics and health centres). RSI independent workers social plan covering the Provence-Alpes Côte d’Azur region (Départements 04, 05, 06, 13, 83 and 84) by anatomical site.

**Figure 3.** Total number (n = 22509) of CT, MR and CM radiographs for the limbs and spine, performed in 2012 in the private sector (private practices, private clinics and health centres). RSI independent workers social plan covering the Provence-Alpes Côte d’Azur region (Départements 04, 05, 06, 13, 83 and 84); cross displaying category of investigation: a: category of investigations by anatomical site; b: anatomical site by category of investigation.

**Figure 4.** Total number (n = 2458) of CTs with direct cavity opacification (n = 1271) and CM radiographs (n = 1187) for the limbs and spine, performed in 2012 in the private sector (private practices, private clinics and health centres). RSI independent workers social plan covering the Provence-Alpes Côte d’Azur region (Départements 04, 05, 06, 13, 83 and 84); cross displaying category of investigation: a: number of investigations as absolute values; b: number of investigations as percentage.
CTs with direct opacification and 28.56% of CM radiographs) (Fig. 4).

Discussion
Rate of use
The overall use of OA imaging investigations in the private sector in our study (CT, MR and CM radiographs) was 68 investigations/1000 person years. In terms of MR and CT only, the private sector usage rate for OA in our study (RSI in PACA in 2012: 26 CT investigations/1000 person years and 38 MR/1000 person years) is higher than the usage rate found in another study (General Scheme for employees in France in 2010: 19 CT investigations/1000 person years and 26 MR investigations/1000 person years) [18]. This difference may be due to the increased use of these investigations between 2010 and 2012, more widespread use of the equipment in PACA compared to the rest of France or a difference between beneficiaries of the RSI and the General Scheme for employees. Whilst the PACA region is within the national average in terms of sectional imaging equipment (1.4 CT machines per 100,000 population and 8 MR machines per million population), it may not be representative of the rest of France in terms of the respective rate of use of CT and MR machines. The reader should consider this reservation in the subsequent discussion.
Extent of the use of MR compared to irradiating investigations

In our study

In the private sector in OA disease, MR is playing an increasing role compared to irradiating investigations [15,16]. In our study over one year, at least one of the investigations was an MR in 48.53% of people who had imaging of their spine (MRI, CT or CM radiographs). The corresponding figures for lower limb and upper limb were 84.10% and 42.05% respectively.

In studies also including the public sector and other indications

Taking CT as the reference investigation in the private and public sectors combined and all OA and non-OA indications combined, the 'number of MR investigations'/'number of CT investigations' ratio is 0.40 (OCDE study [19]); in the private sector alone and all OA and non-OA indications combined, the 'number of MR investigations'/'number of CT investigations' ratio is 0.55 (General Scheme for employees study [18]); in the private sector alone and OA indications alone the ratio of 'number of MR investigations'/'number of CT investigations' is 1.46 (our study) or 1.37 (General Scheme for employees study [18]).

These figures show that:

- the ratio of 'number of MR investigations'/'number of CT investigations' is higher in the private than in the public sector all indications combined;
- the number of MR investigations is higher than the number of CT investigations in OA indications in the private sector;
- the number of CT investigations is higher than the number of MR investigations in other indications in the private sector (such as oncology, stroke or neurology).

Given that France has fewer MR machines than the average in European countries [13] these figures puts the use of the MR machines bank in France in perspective by sector and indication. In addition, a hypothesis often advanced is that if the waiting time for MR is long people firstly have irradiating investigations and then subsequently have MR in addition. In fact, the redundant use of MR and irradiating investigations was low in our study: for the spine 8.62% of people had an MR and an irradiating investigation (this figure was for the lower limb 4.53% and for the upper limb 6.56%).

Potential for substituting irradiating investigations

The dual listing table showing the distribution of people who had investigations by investigation type and by anatomical site shows a significant difference between upper limb, lower limb and spine in terms of the category of investigations used (Table 3). This provides information about the potential for the new dedicated MR machines to substitute for irradiating investigations. At present, for the lower limb, 79.57% of people have already had a multifunctional MR investigation without either CT or CM radiographs but this is not yet the case for the spine and the upper limb for which respectively 60.08% and 64.50% of people had still CT or CM radiographs (Fig. 5), particularly spinal CT without cavity opacification and shoulder CT arthrography (Table 3 and Fig. 4). The new dedicated MR machines need therefore to have a sufficiently wide tunnel to include the proximal end of the limbs. Substitution should follow the Guide for the Correct Use of Imaging Investigations 2013 recommendations [20], which state that MR can be used in place of CT for these two anatomical sites (spine and shoulder).

According to the UNSCEAR 2008 report, the mean effective dose delivered in a CT investigation is 2.4 mSv for a head investigation, 7.8 for a chest investigation, 12.4 for an abdominal investigation, 9.4 for a pelvic investigation, 5.0 for a spine investigation and 3.8 for other sites, hence the importance of the other objective of dedicated MR, to release places in multifunctional MR imaging so that these can be used to substitute for the most irradiating CT investigations (chest, abdomen and pelvis).

It is necessary, however, to increase recording of everyday practice data relating not only to the diagnostic quality of the investigations which will then be performed on dedicated MR machines [15] but also about the diagnostic quality of ultrasound investigations which may also help to reduce patient exposure to ionizing irradiation in osteoarticular diseases.

Conclusion

On the background of a health policy geared towards diversifying the MR machine bank in France (in the form of approval of osteoarticular MR machines) our study supplements data in the literature on the market share of MR investigations amongst imaging methods used for osteoarticular diseases for both the spine and the limbs.

Our study shows in the general population for osteoarticular indications and for machines belonging to the private sector that in 2012 in the PACA region, the number of MR investigations carried out for the Social Plan for independent workers exceeded the cumulative number of CT investigations with or without opacification and radiographs with opacification.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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