Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/15674
DOI URL: http://dx.doi.org/10.21474/IJAR01/15674

RESEARCH ARTICLE

PROBLEMS RELATED TO THE USE OF THE IODE CONTRAST PRODUCT: CHALLENGES AND PROSPECTS IN MALI

Traoré Ousmane[1,5], N'Diaye Mamadou[2], Diarra Oncoumba[3], Diakité Djibril Dit Djoumé[1], Bagayoko Ousmane Lansenou[1], Guindo Ilias[4], Synayoko Kariba[5], Mahamadou Diallo[6], Sidibé Siaka[5] and Keita Adama Diaman[5]

1. Radiology Department of the "Marie Curie" Medical Clinic (Bamako, MALI).
2. Radiology Department of the Military Camp of Bamako-Mali.
3. Radiology Department of the Reference Health Center of Commune III of Bamako- Mali.
4. Radiology Department of the University Hospital Center of Kati-Mali.
5. Radiology Department of the CHU point "G" Bamako-Mali.
6. Radiology Department of the CHU Gabriel TOURE Bamako-Mali.

Manuscript Info

Manuscript History
Received: 10 September 2022
Final Accepted: 14 October 2022
Published: November 2022

Key words:-
Iodine Contrast Agent, Scanner and Mali

Abstract

Introduction: Medical imaging is based on the study of tissue contrasts related to the physical processes used and the physico-chemical nature of the tissues. To increase and/or confirm the information provided by the image, the administration of contrast products was imposed on users. The aim of the work was to harmonize the use of iodine contrast products in the various medical imaging services in Mali.

Methodology: the study took place in the radiology department of the Medical Clinic "Marie Curie" in Bamako, Mali and at the Dermatological University Hospital Center in Bamako. There were 11 health centers in Mali subject to a semi-direct interview during the 3-month period on the use of iodine contrast product supplemented by data from the literature.

Results: In our study, the most used iodinated contrast product was omnipaque with a rate of 46%. The administration of the doses of contrast products usually used was 300 or 350 mg/ml of iodine. Omnipaque dosed at 300 or 350mg/ml of iodine accounted for 28% of cases. The use of the quantity of doses of contrast product administered was 1ml/kg, the most used with 55% of cases. The quantity used in thoracic CT angiography for the search for pulmonary embolism was 100ml with a rate of 28% of the majority of cases. Injections with the automatic injector and by hand were the most common injection methods with a rate of 82% of cases and 18% of cases had used the automatic injector alone. The complications related to the injection of contrast product intravenously manually or by automatic injector recorded during our study were extravasation with a rate of 46%.

Conclusion: Our study made it possible to identify the quantity of contrast product and the dosage used per patient per health center and complications related to their use. We must prohibit the standardization

Corresponding Author:- Traoré Ousmane
Address:- Radiology Department of the "Marie Curie" Medical Clinic (Bamako, MALI).

of the doses used before any examination with harmonization of the use of these PDCs through discussion sessions and educational tools.

Introduction:-

Medical imaging is based on the study of tissue contrasts related to thephysical processes used and the physico-chemical nature of the tissues. To increase and/or confirm the information provided by the image, the administration of contrast products was imposed on users. Many examinations require the use of contrast medium. For the manipulator, authorized to administer them to the patient within a regulatory framework and through the required skills. Today, it is estimated that between 40 and 50 million annual injections of iodinated contrast product are performed worldwide, with a trend towards a permanent increase [1].Radiology is now at the heart of modern medicine, offering the population as a whole the benefit of innovative and personalized care. The common use of contrast products is intended to change injection protocols. It is above all a question of justifying its use [2,3]. Then to use in the fairest way and which must adapt both to the patient and to the organ of interest, as well as to the specific clinical context [2; 4]. The optimization of the contrast in the image then goes through the optimization of the CT scan instrumentation. The Mercier judgment of May 20, 1936 defined fault as non-compliance with "the commitment to provide not just any care, but conscientious, attentive, and subject to exceptional circumstances, in accordance with the acquired data of science" [5]. The most used contrast products in Mali are known under the names: Iohexol (Omnipaque^{R}), Iopromide (Ultravist^{R}), Ioxitalamic acid (Télébrix^{R}) and Optiray (Opaxol^{R}). Our objective is to harmonize the use of iodine contrast products in the various medical imaging departments in Mali by synthesizing the current recommendations of learned societies and data from the literature on issues related to the use of contrast products iodine.

Methodology:-

We had proceeded to the analysis of our own experiences on the use of iodine contrast product in the Medical Clinic "Marie Curie" of the commune V of Bamako and at the dermatological hospital of Bamako over a period of 3 months. It was supplemented by the data received through semi-direct interviews with our colleagues responsible for the use of iodine contrast product in the various medical imaging departments in Bamako and in the different regions of Mali (Major or technician in charge of the department or the radiologist, head of unit). Wealsoanalyzed data from the literature. The analysis and data entry were done with the software: Epi info and Excel.

Results:-

We collected data from 11 health facilities at the University Hospital Center level at the regional and private sector level using approximately 10,000 injections of contrast product per quarter. The most used iodinated contrast product in our study was omnipaque with a rate of 46%. 27% of cases were found in centers that use both omnipaque and Telebrix. Ultravisl, Telebrix and Opaxol were used in 9% of cases, 9% of cases and 9% of cases respectively(Figure 1).

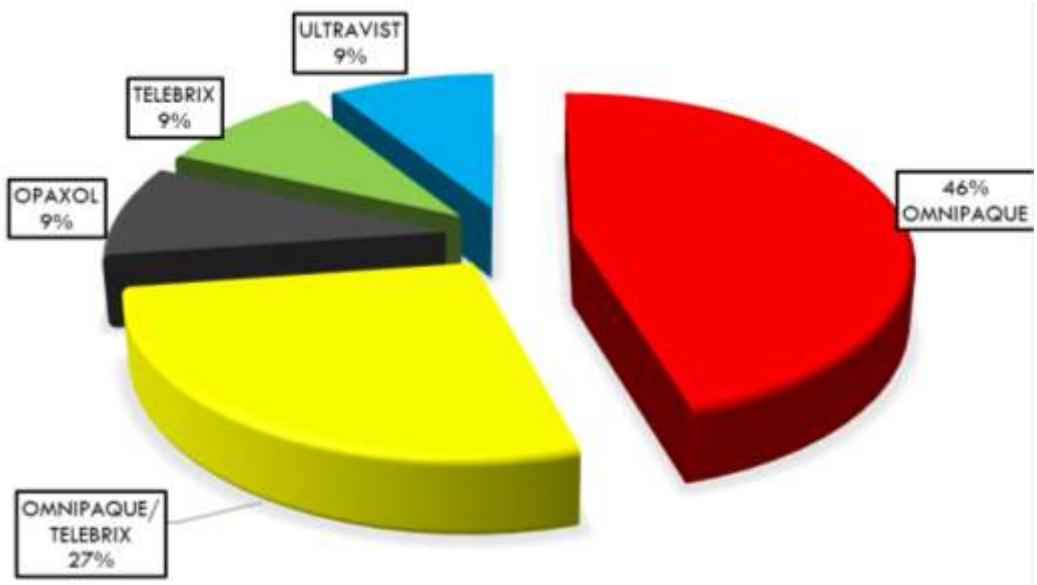

Figure 1:- The use of different contrast products by health center.

The administration of the doses of contrast products usually used was 300 or 350 mg/ml of iodine. Omnipaque dosed at 300 or 350mg/ml of iodine accounted for 28% of cases. The other contrast products including the combined use of omnipaque or Telebrix dosed at 300 and 350 mg/ml accounted for 27% of cases, Omnipaque alone at 300 mg/ml represented 18% of cases, 9% of cases found in centers using Ultravisl 300 or 350mg/ml, Telebrix 350mg/ml and Opaxol 300mg/ml (Table 1).

Table 1:- Use of iodinated contrast agent dosage.

Contrast agent	Dosage	Percentage (%)
Omnipaque	300-350mg/ml	28
Omnipaque et Télébrix	300-350 mg/ml	27
Omnipaque seule	300 mg/ml	18
Ultravist	300-350 mg/ml	9
Télébrix	350 mg/ml	9
Opaxol	300 mg/ml	9
Total		100

The use of the quantity of doses of contrast product administered was 1ml/kg, the most used with 55% of cases. The quantity administered at 2 mg/kg had represented 9% of the cases; the doses between 0.5-1 mg/kg were in 9% of the cases, between 0.5-2 mg/kg; between 1-1.5 mg/kg and between 1-2 ml/kg (Figure 2).

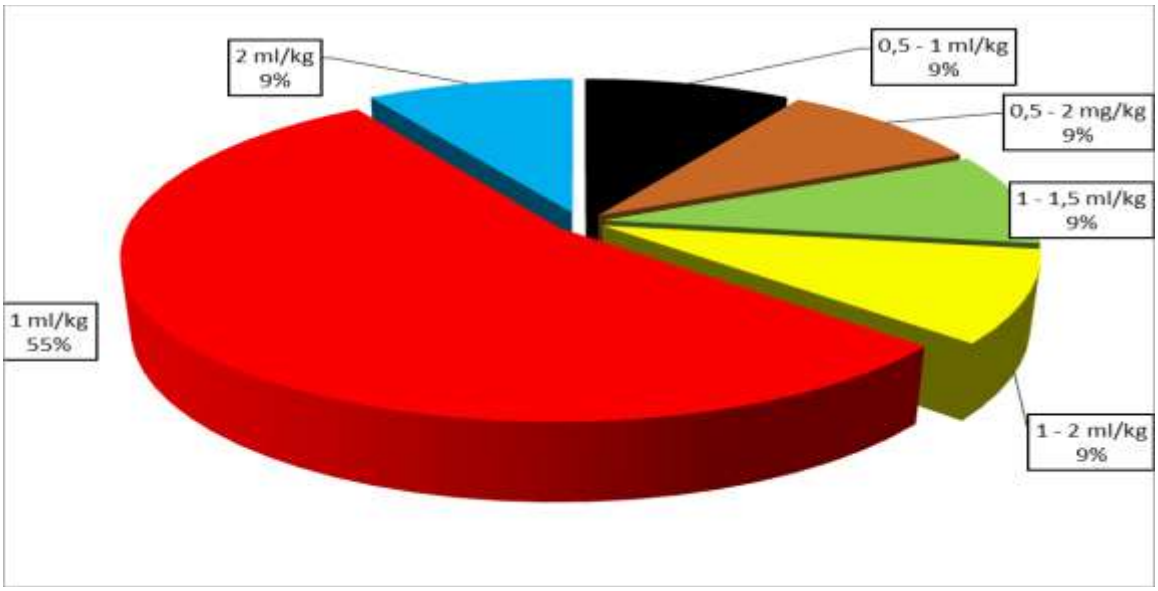

Figure 2:- The amount of dose administered per kilogram of body weight according to health centers.

Some public or private health centers use a stable and standardized quantity of iodine product without taking into account patient weight. And the quantity used in thoracic CT angiography for the search for pulmonary embolism was 100ml with a rate of 28% of cases in the majority, it varies according to the centers from 30ml to 150ml. The other CT angiograms such as the exploration of the large abdominal vessels (aorta), the supra-aortic trunks and the vessels of the lower limbs varied from 95 ml to 200 ml per patient, the majority of which represented 18% of cases in favor of 150 ml. We had used in oncology for extension assessment and for health assessment an average quantity of 100 ml with 27% of cases (Table 2).

Table 2:- Average amount of contrast medium used per exam.

Exam	Average amount of contrast medium	Percentage (%)
CT angiography /embolism	100ml	28
CT angiography / aorta	150 ml	18
computed tomography in oncology / extension assessment	100ml	27
computed tomography / vascular exploration	100ml	27
Total		100

Injection with the automatic injector and by hand was the most common injection methods with a rate of 82% of cases and 18% of cases had used the automatic injector alone. Those who used automatic injectors and manual injection did not preheat contrast products with a rate of 55% of cases. 9% of cases were doing PDC preheating with the use of the auto injector only (Figure 3)

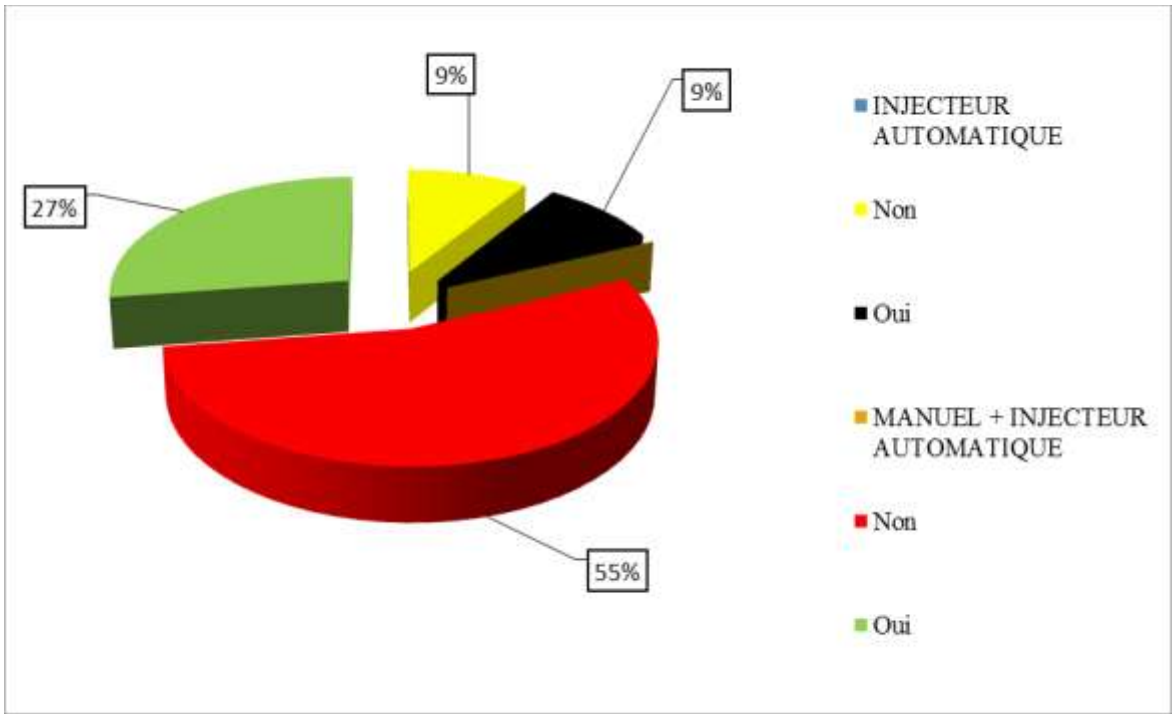

Figure 3:- Distribution of the preheating system according to the use of the automatic injector or manual injection.

The complications related to the injection of contrast product intravenously manually or by automatic injector recorded during our study were extravasation with a rate of 46%, allergic reactions represented a rate of 45% of cases (Figure 4).

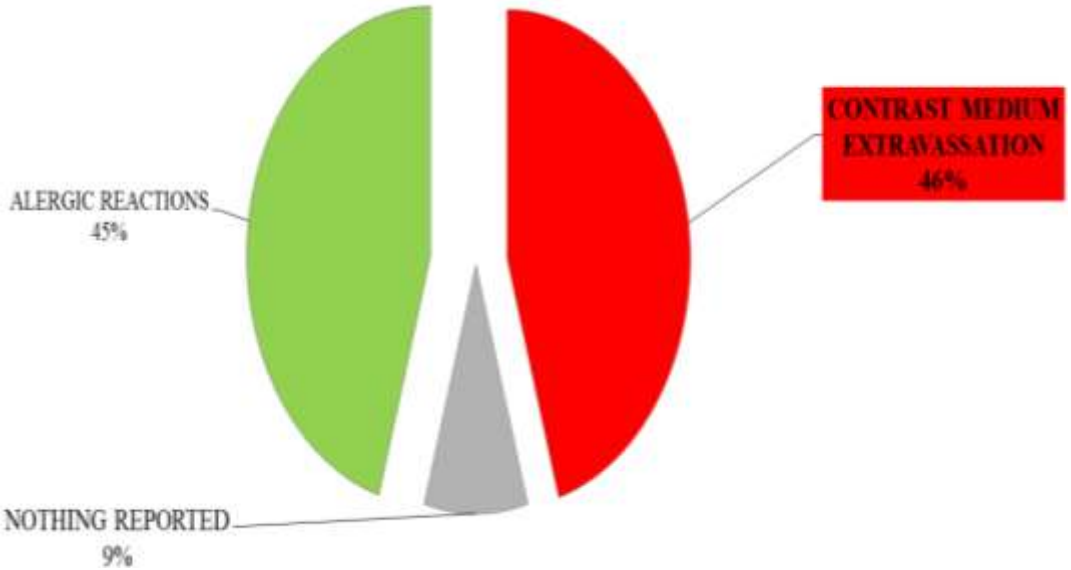

Figure 4:- Complications related to the injection of iodine contrast product.

Commentary And Discussion:-

Optimization of the injection rate and the injection duration:

In vascular imaging, the objective is to obtain an enhancement in the arterial phase (300 HU). According to the literature, the iodine flow rate at 120 kV must be between 1.2 and 1.6 g of I/s in general vascular conditions and 2 g of I/s for Coro scanners [4, 6, 7, 8]. There is no need to continue injecting a contrast product after the vessel of interest has been opacified, except in combined protocols (vascular and portal phase, CT phleboscan) [4]. In our study, the omnipaque was the most used with 46% of cases, the dose usually used being 300mg/ml and 350mg/ml

with a rate of 28% of cases. The administration of the contrast product at 1ml/kg was the most used in 55% of cases. And the quantity of these contrast products used in chest CT angiography was 100ml in 28% of cases, but in the other CT angiograms, we found 150ml in 19% of cases. In oncology for extension assessment, the quantity of 100ml was the mostused in the order of 28% of cases.

Other optimization factors:

Rinsing with physiological saline (30 to 40 ml of saline is sufficient) to remove the contrast product from the tubing and the proximal venous network [4,6]. This was done in most of our health centers. Heating the contrast product to 37°8 C reduces the viscosity of the contrast product and therefore the injection pressure [4]. Injection with the automatic injector and by hand was the most common injection methods with a rate of 82% in our study. Those who used automatic injectors and manual injection did not preheat contrast products with a representative rate of 55% of cases. These optimization factors require situable hardware [4, 6, 7,9]

Complication of contrast product:

The radiologist and the radiology technician engage their medical responsibility during their practice. During the realization of X-ray imaging assessments (x-rays or scanners), he is led to use iodinated contrast products, which like other drugs, have contraindications and are likely to cause many side effects. . Some of these effects are potentially very dangerous and may cause harm to the patient [5]. Here we want to consider the main possible complications through the prism of current acquired knowledge of the specialty. The side effects of iodinated contrast agents are a source of problems in radiology. Complications of their use, dominated by hypersensitivity reactions [5], in our series we found 45% of cases and extravasation was the main cause of complication with a rate of 46%. The consequences of renal toxicity are rare but potentially fatal [5]. It is important that the radiologist knows how to use these contrast agents knowing the limitations of their use, the prevention and treatment of complications. Although the consensus is not total on these points, the radiologist must rely on the recommendations of learned societies, including the SFR, and on validated elements of the medical literature in order to claim good clinical practice, in accordance with the acquired and current data of science [5].

Conclusion:-

We had reassessed all the iodinated contrast products used for their opacifying properties in radiodiagnosis across Mali in the various health structures. These contrast products went by their trade names of Omnipaque, Telebrix, Ultravist and Opaxol. The place of these medicines for diagnostic use depends on their mode of use, their quantity and their dosage in mg/ml of iodine. Our study made it possible to identify the quantity of PDC and the dosage used per patient per health center and complications related to their use. We must prohibit the standardization of the doses used before any examination with harmonization of the use of these PDCs through discussion sessions and educational tools.

Conflict of interest:

The authors declare no conflict of interest.

Reference:-

1. **Dewachter P, Mouton-Faivre C, Laroche D, Clément O**. Immediate allergy to iodinated contrast products and prevention of reactions. Rev Med Internal 2009;30:872—81.
2. **Kwee TC, van Ufford HM, Beek FJ, Takahara T, Uiterwaal CS, Bierings MB, Ludwig I, Fijnheer R, Nievelstein RA**. Whole-body MRI, including diffusion-weighted imaging, for the initial staging of malignant lymphoma: comparison to computed tomography. Invest Radiol. 2009;44(10):683-90.
3. **Osborne ED, Sutherland CG, Scholl Jr AJ, Rowntree LG**. Roentgenography of urinary tract during excretion of sodium iodide. JAMA 1923;80:368—73.
4. **O. Clément et col**. CIRTACI recommendations on the optimization of the injection of iodinated contrast products in computed tomography – Vascular explorations: Journal of diagnostic and interventional imaging 2020;3:151 – 156https://doi.org/10.1016/j.jidi.2020.03.003
5. **H. Hassani et al**.Medical accidents related to the use of iodinated contrast agents in radiodiagnosis: elements for determining the medical responsibility of the radiologist:http://dx.doi.org/10.1016/j.medleg.2012.04.001
6. **Haute autorité de la santé(HAS).**Reassessment of iodine contrast products: Medical, Economic and Public Health Assessment Division/ summary 3 Opinion of May 15, 2013.

7. **Jia CF, Zhong J, Meng XY, Sun XX, Yang ZQ, Zou YJ, et al**. Image quality and diagnostic value of ultra-low-voltage, ultra-low-contrast coronary CT angiography. Eur Radiol 2019; 29:3678 – 85.
8. **Carrascosa P, Capunay C, Rodriguez-Granillo GA, Deviggiano A, Vallejos J, Leipsic JA**. Substantial iodine volume load reduction in CT angiography with dual-energy imaging: insights from apilot randomized study.Int J Cardiovasc Imaging2014; 30:1613 – 20.
9. **Shin HJ, Kim SS, Lee JH, Park JH, Jeong JO, Jin SA, et al**. Feasibility of low-concentrationiodinated contrast medium with lower-tube-voltage dual-source CT aortography using iterativereconstruction: comparison with automaticexposure control CT aortography. Int J Cardiovasc Imaging 2016; 32:53 – 61.