

# Feasibility of Scanopelvimetry in the Medical Imaging Department of the University Hospital of Point “G”

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## Abstract

**Purpose:** The purpose of our study was to describe the technique of scanopelvimetry used in the radiology department of the Point G University Hospital, to specify the indications of scanopelvimetry in the department and to evaluate the cost of radiopelvimetry. **Patients and Method:** This was a prospective, cross-sectional study that took place over a 12-month period from January 1 to December 31, 2018. It focused on pregnant women in whom scanopelvimetry was performed in the medical imaging department of Point G University Hospital during the study period. **Results:** Out of 8615 CT examinations performed in the radiology department, we collected 65 cases of scanopelvimetry, *i.e.*, 0.7% of the CT examinations. Primigravida and paucigravida dominated the study (40% each). In 60% of the pregnant women the height was less than 150 cm. The most frequent indication for CT scanning was clinical pelvic narrowing (50%). In 80% of the cases, the scanopelvimetry was performed after 37 weeks of amenorrhea. A predominance of narrowing of the superior strait was noted (40%). 4.6% of the pregnant women had a Magnin index of less than 20. CT scanopelvimetry is a feasible examination in



our context but the level of demand is low because of the high cost of the examination (49500 fca). **Conclusion:** In light of the results obtained, we can say that CT pelvimetry allows us to predict the probable route of delivery and thus we can reduce the risk of fetomaternal morbidity and mortality to improve maternal and child health.

## Keywords

Scanopelvimetry, Prognosis, Magnin Index, Delivery

## 1. Introduction

CT pelvic imaging is performed using X-rays, and there are two methods: sequential and helical [1]. The contribution of pelvimetric study by CT scan has been indisputable for more than a decade. The precision is sub-millimetric, the measurements being direct, with no possible inaccuracy as long as the technical criteria are respected. The accuracy of these measurements and the speed of acquisition of the slices have contributed to the increasing substitution of this CT pelvimetry technique for conventional pelvimetry. [2] [3]. Its results combined with those of the clinic and ultrasound allows the obstetrician-gynecologist to establish the prognosis of the delivery [1].

According to the WHO, dystocia ranks 5th with 11% of direct causes of maternal mortality [3]. In fact, next to hemorrhage, infections and complications of hypertension during pregnancy, dystocia occupies a predominant place among the avoidable causes of maternal mortality [3].

In Mali, very few studies have been devoted to scanopelvimetry. Thus, we initiated this study with the aim of specifying the feasibility of CT scanning in our practice.

## 2. Material and Method

Our study took place in the radiology department and the gynecology-obstetrics department of the University Hospital of Point G. It was a prospective and cross-sectional study over a 12-month period from January 1 to December 31, 2018.

We used in our study a sample composed of pregnant women in whom scanopelvimetry was performed during the study period in the imaging department. Not included were all CT scans other than scanopelvimetry.

We used systematic sampling with the population selected at a random starting point but with a fixed sampling interval, and study period. The fixed sampling interval was calculated by dividing the population size 65 scanopelvimetries by the sample size of 8615 scanners. Data collection was performed from the results of the scanopelvimetry and the prenatal diaries. A Toshiba Aquilion 16 (multi-bar scanner) from the Radiology Department of the University Hospital of Point “G” was used. Millimetric helical acquisitions (0.5 to 1 mm) were

performed over the entire pelvis without injection of contrast medium.

During the examination, the pregnant woman was placed in dorsal recumbency, with her head towards the stand and her thighs slightly flexed. The landmarks were the upper end of the iliac wings for the upper limit and the greater trochanters for the lower limit. The average voltage was 80 kV and the amperage was 50 mAs. The average acquisition time was 5 seconds.

The standards used in our study were, promonto-retropubic diameter is considered normal if it is greater than or equal to 105 mm, borderline if it is between 105 mm and 85 mm, and surgical if it is less than or equal to 85 mm. The medial transverse diameter is considered normal if it is greater than or equal to 115 mm, borderline if it is between 115 mm and 95 mm, and surgical if it is less than or equal to 95 mm. The bi-spinous or bi-sciatic diameter is considered normal if greater than or equal to 95 mm, borderline if between 95 mm and 80 mm, and surgical if less than or equal to 80 mm.

Magnin's index is considered normal if it is greater than or equal to 23 mm, borderline if it is less than 23 mm and greater than 20 mm, and surgical if it is less than or equal to 20 mm.

The main difficulties encountered during our study were:

- The multiple failures of the CT machine.
- The absence of a storage system for the CT images for a long period of time.
- High cost of CT scanning for parturients.

Text and table entry was done on Word 2010 and Excel 2010 software. Statistical analysis of the data was done using SPSS software.

During the prospective phase, we informed the pregnant women about the importance of pelvimetry, the dangers of pelvic narrowing and the objectives of the study. Thus, their consent was obtained and assurance was given that no reported results would identify the pregnant woman.

### 3. Results

Out of 8615 CT scans performed in the radiology department, we collected 65 cases of scanopelvimetry, *i.e.*, 0.7% of the CT scans.

During this study, we noted a predominance of the age group of 20 - 35 years. Housewives were the most frequent with 70%. Of the 65 women who underwent CT scanning, 59 were married (90.7%) and only six were single. The primigravida and paucigravida dominated the study with 40% each.

Ten percent (10%) of our patients had had an abortion during previous pregnancies and 40% of the cases had previously given birth by cesarean section. In 60% of the pregnant women, the height was less than 150 cm. Obstetrical ultrasound results were normal in 30% of cases.

The most frequent indication for CT scanning was clinical pelvic narrowing in 50% and scarred uterus in 14%. In 80% of the cases, scanopelvimetry was performed after 37 weeks of amenorrhea.

The volumetric scanopelvic technique was performed in 80% of our sample. The cost of the scanopelvimetry is almost similar to the costs of other CT ex-

aminations in our department, *i.e.*, 49500 Fcfa, and the insurance companies cover 70% to 80% of the costs.

The dose length product received was 200 - 300 mGy for the majority of our pregnant women (70% of cases). According to the results of the CT scan, 60% had a promonto-retropubic diameter greater than or equal to 150 mm (**Table 1**). In 50% of the patients, the median transverse diameter was between 95 and 115 mm. In 80% of patients, the bi-spinous diameter was greater than or equal to 95 mm.

In 50% of the cases, the length of the sacral cord was between 100 - 150 mm and the sacral sag was less than or equal to 10 mm.

Through the promonto-retropubic diameter and the median transverse diameter, anatomically we noted a predominance of narrowing of the superior strait in 40%. The Magnin index was less than 20 cm in 4.6%; it was between 20 - 23 cm in 46.1% and 49.2% of the pregnant women had a Magnin index greater than or equal to 23 cm. According to the mode of delivery of parturients, vaginal delivery represented 80% of our sample and 20% of cases of delivery by cesarean section.

By establishing the relationship between the mode of delivery and the Magnin index, we noted that the delivery was by vaginal route in all cases where the Magnin index was normal, by cesarean section only in 14.3% of cases of inside Magnin limit and in all cases of inside Magnin surgical (**Tables 1-6**). Iconography (**Figure 1** and **Figure 2**).

**Table 1.** Distribution of parturient according to promonto-retropubic diameter (PRP).

PRP	Workforce	Percentages
≥105 mm	39	60
85 mm - 105 mm	26	40
<b>≤85 mm</b>	<b>00</b>	<b>00</b>
Total	65	100

**Table 2.** Distribution of parturients by median transverse diameter.

DTM	Workforce	Percentages
≥115 mm	26	40
<b>95 mm - 115 mm</b>	<b>33</b>	<b>50.7</b>
≤95 mm	6	9.3
Total	65	100

**Table 3.** Distribution of parturients according to the bi-spinous diameter.

Bispinous diameter	Workforce	Percentages
<b>≥95 mm</b>	<b>48</b>	<b>73.8</b>
80 mm - 95 mm	11	16.9
≤80 mm	06	9.3
Total	65	100

**Table 4.** Distribution of parturients according to the length of the sacral spine.

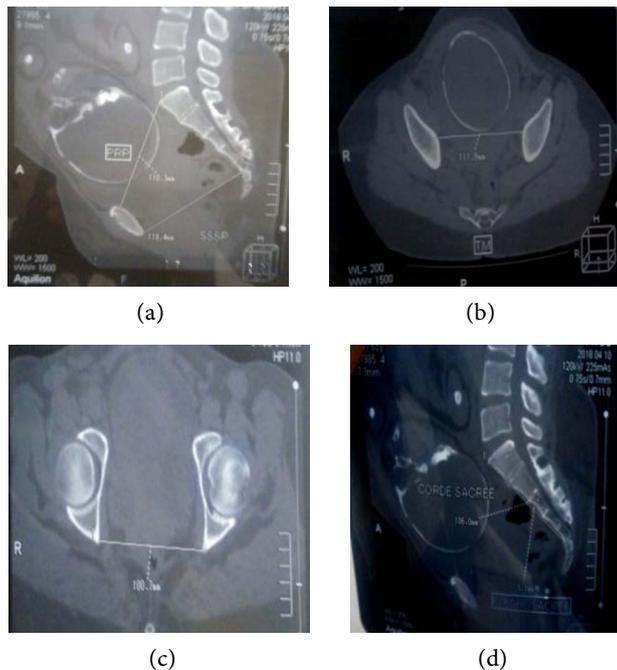
Sacred Arrow	Workforce	Percentages
≤10 mm	32	49.2
>10 mm	33	50.7
Total	65	100

**Table 5.** Distribution of parturients according to Magnin index.

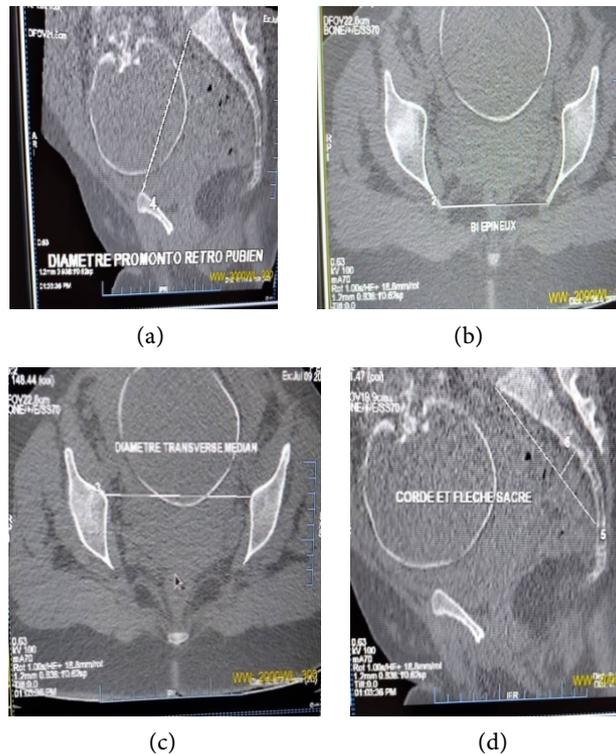
Magnin Index	Workforce	Percentages
≥23	32	49.2
20 - 23	30	46.1
≤20	03	4.6
Total	65	100

**Table 6.** Relationship between mode of delivery and MAGNIN (IM) index.

		Delivery mode		Total
		vaginal delivery	caesarean section	
Scanopelvimetry result	IM normal	32	00	32
	IM limit	26	04	30
	Surgical MI	00	03	03
Total		58	07	65



**Figure 1.** (a) promonto-retro pubic and sub sacro pubic diameter, (b) medial transverse diameter, (c) bi-spinous diameter, (d) sacral cord and arrow.



**Figure 2.** (a) promonto-retro pubic diameter, (c) medial transverse diameter, (b) bi-spinous diameter, (d) sacral cord and arrow.

#### 4. Discussion

The limitations of the study are the low number of patients (65 requests in 12 months), probably due to the cost of CT scans in Mali. However, our work has shown that the examination is feasible in our center.

During this study, we collected 65 cases of scanopelvmetry out of 8615 CT examinations performed, *i.e.*, 0.7% of all CT examinations. This frequency is higher than that of Traoré Y [4], who found in his study 36 cases of scanopelvmetry out of 9237 CT examinations performed. This frequency of scanopelvmetry compared to other scans could be explained by the low demand for the examination by prescribers linked. On the one hand, to the lack of knowledge of this examination by clinicians and on the other hand, to the low financial means of these pregnant women in our countries.

The age range of 20 - 35 years was the most represented, *i.e.*, 80% of cases. In Morocco, Ould Jdoud C [5] found an average age of 22.5 years and 92.97% of the patients were between 17 - 32 years. This relatively young age range can be explained by the high rate of early marriage and early entry into sexual life.

In our series, housewives represented the major part of the study population, *i.e.*, 70% of the cases. This can be explained by the low schooling rate of girls or by their high school dropout rate.

Our study population consisted mostly of married pregnant women with 90.7% of cases. This frequency is similar to the 88.9% of Traore Y *et al.* [4]. This is due to the religious context of our environment, which in most cases prevents

conception outside of marriage.

In our study, primigravida and paucigravida each represented 40% of cases. Traoré Y. [4] found 69.4% of primigravida and 30.6% of paucigravida. This difference could be explained by the small size of our sample.

In our study, 60% of the pregnant women were less than 150 cm in height, compared to 40% of cases larger than 150 cm. Our result is comparable to that obtained by Chaoui A [5]. A size of less than 150 cm is a sign of poor prognosis for vaginal delivery.

In our study, 50% of the prescribers were obstetricians and midwives who requested scanopelvimetry and the examination was motivated by the “clinical suspicion of pelvic narrowing” and a scarred uterus 30%.

Volumetric scanopelvimetry was used in 80% of cases because of the speed of acquisition of the slices. This technique is very comfortable for the pregnant woman, as she only has to lie supine for a very short period of time (15 seconds maximum).

Conventional scanopelvimetry accounted for 20% of the cases whose acquisition time was greater than the acquisition time for volume scanopelvimetry.

#### **Radiation dose:**

In our study, the majority of pregnant women received a dose between 200 - 300 mGy including 70% of the cases. 20% of the cases received a dose between 100 - 200 mGy and 10% of the cases for a dose above 300 mGy. The radiation dose emitted at the center of the phantom measured with helical acquisition is identical to that calculated during conventional scanopelvimetry. It should be remembered that the irradiation in helical pelvimetry is reduced by 1.5 to 3 times compared with conventional pelvimetry, evaluated according to the studies between 0.4 and 3.8 mGy (dose delivered to the fetus) [6] [7].

In our study, the narrowing of the upper strait was the most frequent, *i.e.* 40%; we note, however, that any pelvis with an anteroposterior diameter of less than 10.5 cm is flattened and platypelloid. Generalized strictures were present in 40% of our patients. These results are comparable to those of Malian authors [4].

In our study, the Magnin index was less than 20 cm in 4.6%; (Table 5), it was between 20 - 23 cm in 46.1% and 49.2% of pregnant women had a Magnin index greater than or equal to 23 cm. According to the literature, any pelvis with a Magnin index of less than 20 cm is a surgical pelvis [4].

The obstetrical course of action was delivery by vaginal delivery in all cases where the Magnin index was normal, by caesarean section only in 14.3% of cases of borderline Magnin index and in all cases of surgical Magnin index (Table 6). These data are similar to those in the literature. [4] [8] This result highlights the importance of this index in the prognosis of the delivery.

## **5. Conclusion**

CT pelvimetry is a feasible examination in our context. The multibar helical scanner allows a new approach to pelvimetry meeting, the requirements of ob-

stetricians by privileging the morphological study of the pelvis. This technology is highly accurate and has a low radiation exposure compared to conventional pelvimetry techniques. The speed of realization and the gain in comfort for the pregnant women associated with the data presented plead in our practice in favor of volumetric pelvimetry. In light of the results obtained, we can say that CT pelvimetry helps to predict the probable route of delivery, and thus reducing the risk of maternal-fetal morbidity and improving maternal and infant health. The cost of this examination in our hospital is 49500 Fcfa.

### Conflicts of Interest

The authors declare no conflicts of interest.

### Author Contributions:

All authors contributed to data acquisition, data analysis and interpretation, and writing of the article.

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