Evaluation of the Diagnostic Role of Hysterosalpingography in Cesarean Scar Niche Diagnosed by Hysteroscopy

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Abstract

Background: term CS niche (defect) describes the presence of hypoechoic area within the myometrium in the isthmus (lower uterine segment) with discontinuation of myometrium at the site of previous CS. Cesarean sections have increased worldwide and there is an increasing awareness of the adverse long-term sequelae associated with the procedure. The World Health Organization estimates that there are approximately 18.5 million women who undergo this procedure annually, with rates in the Western world increasing from 14.5% to 27.2% between the years 2000 and 2017.

Aim of the Work: To evaluate diagnostic role of hysterosalpingography (HSG) in cesarean scar niche at Early Cancer Detection and Gynecological Endoscopy Unit at Ain Shams Maternity Hospital within 6 months.

Patients and Methods:

Type of Study: Diagnostic Accuracy Test.

Study Setting: Early Cancer Detection and Gynecological Endoscopy Unit at Ain Shams Maternity Hospital.

Study Period: 6 Months from the first of March 2022 to the end of August 2022.

Study Population: All women undergoing Office Hysteroscopy at Early cancer Detection and Gynecological Endoscopy Unit at Ain Shams Maternity Hospital was checked to meet the inclusion criteria for the study.

Results: There was not statistically significant between according to number of C.S. delivery. HSG test has low sensitivity (16%) but high PPV (100%) for detecting this condition, while the hysteroscopy has higher sensitivity (100%) but an undefined specificity and PPV since there are no true negatives. The NPV is 0% for both tests since there are no true negatives. The study results cannot provide recommendation regarding routine Hysterosalpingography examinations of CS scar defect. Women should avoid CS without medical indications and multiple abortions with uterine curettage. Nevertheless, more prospective high-quality studies are needed to establish the clinical significance of the CS scar niche and to define guidelines for the possible prevention of the CS scar niche in a subsequent pregnancy.

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Conclusion: no sufficient evidence to recommend HSG as a first-line diagnostic tool for cesarean scar niche. However, in healthcare settings without ready access to hysteroscopy HSG may serve as an acceptable alternative as it is well-tolerated, cost-effective, less invasive and doesn't require special training rather than hysteroscopy, but hysteroscopy is still the valuable gold standard for detecting high-probability patients, even asymptomatic.

Keywords: Hysterosalpingography, Cesarean Scar Niche, Hysteroscopy.

INTRODUCTION

The term CS niche (defect) describes the presence of hypoechoic area within the myometrium in the isthmus (lower uterine segment) with discontinuation of myometrium at the site of previous CS [(1)].

Cesarean sections have increased worldwide and there is an increasing awareness of the adverse long-term sequelae associated with the procedure. The World Health Organization estimates that there are approximately 18.5 million women who undergo this procedure annually, with rates in the Western world increasing from 14.5% to 27.2% between the years 2000 and 2017 [(2)].

A cesarean scar niche, first described in 1961 when a wedge-shaped defect was noted in the uterine wall of a patient who had previously had a cesarean section during hysterosalpingography, [(3)] is defined as the presence of a hypoechoic area and discontinuation of the myometrium at a previous lower-segment cesarean section scar site [(4)]. Cesarean niche is also referred to as a cesarean scar defect, isthmocele, or a diverticulum. The presence of a cesarean scar niche is associated with gynecological symptoms such as abnormal uterine bleeding, dysmenorrhea, and subfertility, as well as potential adverse obstetrical outcomes resulting from cesarean scar pregnancy (CSP), uterine rupture, and placenta accreta spectrum (PAS) disorders [(5)].

Cesarean scar defects are being more commonly reported but the incidence varied between 24 and 84%. Some women are asymptomatic, but others may have gynecologic symptoms [(6)] such as postmenstrual spotting, prolonged menstruation, continuous brown discharge, chronic pelvic pain [(8)], and secondary infertility. These symptoms, taken together, have been closely investigated and are called cesarean scar syndrome [(8)]. Other problems associated with cesarean scar defect are a higher risk of complications during subsequent pregnancy, such as dehiscence, placenta previa or accrete and cesarean scar ectopic pregnancy, and difficulty with gynecologic procedures like uterine evacuation, hysteroscopy, and intrauterine device insertion [(1)].

Recently, the clinical relevance of cesarean scar defects has attracted an increasing amount of attention, with more review articles published, because cesarean rates are rising worldwide. The etiology of niche related postmenstrual spotting and pain has not been fully elucidated. They are thought to be caused by retention of menstrual blood in a niche, which is intermittently expelled after most of the menstruation has ceased [(4)].

Cesarean section is the most performed surgical procedure involving the uterus in the fertile women [(9)], with the low transverse incision being the most common type of uterine hysterotomy. In the interpretation of HSG, awareness of the appearance of the cesarean scar defect is important in avoiding misdiagnosing the scar for underlying pathology or normal variants such as prominent cervical glands, post myomectomy diverticulum, synechiae, and focal adenomyosis [(10; 11)].

AIM OF THE WORK

To evaluate diagnostic role of hysterosalpingography (HSG) in cesarean scar niche at Early Cancer Detection and

Gynecological Endoscopy Unit at Ain Shams Maternity Hospital within 6 months.

PATIENTS AND METHODS

Type of Study: Diagnostic Accuracy Test.

Study Settings: at Early Cancer Detection and Endoscopy Gynecological Endoscopy Unit at Ain Shams Maternity Hospital.

Study Period: 6 Months from the first of March 2022 to the end of August 2022.

Study Population: All women undergoing Office Hysteroscopy at Early cancer Detection and Gynecological Endoscopy Unit at Ain Shams Maternity Hospital was checked to meet the inclusion criteria for the study.

Inclusion Criteria: age more than 18 years, previous history of cesarean delivery, cesarean scar niche confirmed by Hysteroscopy and premenopausal status.

Exclusion Criteria: pregnancy, contrast allergy, active pelvic infection and medical history interfering with HSG.

Sampling Method: convenience sampling method.

Sample Size: sample size was calculated using PASS program, setting the type-1 error (α) at 0.05 and the power (1-β) at 0.8. Results from previous study (Dalfo et al., 2004), showed that HSG had a sensitivity of 81.2% and a specificity of 80.4%, in comparison with hysteroscopy. Calculation according to these values produced a sample size of 50 cases.

Ethical Considerations: our study received the approval of the local Ethical Committee of Faculty of Medicine, Ain Shams University. The protocol was discussed by the ethical scientific committee for approving the study a written informed consent was obtained from all participants before starting the procedure after explanations the steps and the potential complications of each diagnostic modality. Study Population was selected regarding the appropriate inclusion and exclusion criteria.

Study Procedures: ***After a written consent was taken, the recruited women were subjected to the following:*** careful and detailed history, personal history: Age, name, residence, occupation, socioeconomic standard, and special habits of medical importance, menstrual cycle history, detailed obstetric history with taken the number of spontaneous abortions (causes, gestational age if possible) and past medical history: history of cardiac problems, history of diabetes mellitus, hypertensive disorders, chest diseases, renal diseases, blood diseases or bleeding tendency and surgical intervention, dilatation and curettage and the occurrence of post-operative complication.

Physical examination, Including: general examination, vital data (temperature, blood pressure, respiratory rate, pulse), chest and cardiac examination, abdominal examination and pelvic examination.

Office hysteroscopy procedure: Technique: the hysteroscopic examination was performed using a rigid 30-degree hysteroscope with a 4 mm diameter diagnostic sheath (Karl Storz Endoscope, Turrlingen, Germany). High-intensity cold light source and fiber optic cable were used to illuminate the uterine cavity. Normal saline solution was used to distend the uterine cavity with flow between 200 and 350 ml/min, at 30-40 mmHg. Patient was placed in the dorsal lithotomy position, after the patient was asked to empty her bladder. The thighs should be at a 90-degree angle to the pelvis to create enough space for the surgeon to manipulate the hysteroscope.

The patient perineum should be just past the edge of the table. Normal saline was used for uterine distension connected to the inflow channel on the sheath with intravenous tubing.

A vaginal wash with saline solution was performed without placing speculum. Before the hysteroscope and sheath insertion into the external os, the sheath was flushed to

remove the air. The tip of the hysteroscope was positioned in the vaginal introitus, the labia being slightly separated with fingers. The vagina was distended with saline. The scope was driven to the posterior fornix to readily visualize the cervix and slowly backwards to identify the external cervical os. When this became visible, the scope was carefully moved forward to the internal os and then the uterine cavity with least possible trauma. The uterine cavity was systematically explored by rotating the fore-oblique scope to identify any anomaly in the uterine walls and/or the right and left tubal ostia. At this stage it is crucially important to avoid lateral movements as much as possible to reduce patient discomfort to a minimum. After that, the scope was removed, and the patient was asked to remain in the dorsal position for a few minutes to avoid vasovagal attack.

Niche criteria in Hysteroscopy: cesarean scar niche appears as a pouch-like anatomic defect on the anterior wall of the isthmus or of the cervical canal its superior third or less frequently at its mean inferior third. Niche location essentially depends on the site of the cesarean section, as patients with the defect in the higher part of the cervix previously underwent elective cesarean section, whereas in those in whom cesarean section was done in presence of cervical modifications, isthmocele is localized in the lower part of the cervical canal.

HSG procedure: (Ryan G Steward, 2021, Medscape) HSG was done at The Diagnostic Radiology Unit at Ain Shams Maternity Hospital. Hysterosalpingography was performed by radiologist of the diagnostic radiology unit. HSG was done between the 6th and 11th days of menstrual cycle (Day 1 is the first day of menstrual bleeding). Patient in lithotomy position. The uterine position was determined by a pelvic examination. The hysterography placed into the cervical canal, and the radio opaque material dissolved in 10-20 cc water and injected into the uterine cavity slowly with the assistance of fluoroscopy. An x-ray examination was performed twice: first, in the filling period of the uterine cavity by contrast material, and second in the spreading period of the abdomen.

Niche criteria in HSG x-ray film: A diverticulum or a pouch-like anatomic defect located at the site of previous caesarean delivery scar at the lower uterine cavity, uterine isthmus, or upper endocervical canal in patients with history of cesarean delivery.

Data management and statistical Analysis: data were collected, tabulated, and statistically analyzed using SPSS 22.0 for windows (SPSS Inc., Chicago, IL, USA) and Med Calc 13 for windows (Med Calc Software, Ostend, Belgium). Qualitative data were described using number and percent and were compared by Chi2 test. Quantitative data were described using mean, standard deviation (SD), median, range, and interquartile range (IQR). The diagnostic value indices including the specificity, sensitivity, positive and negative predictive values as well as accuracy for the results were calculated. The significance of the obtained results was judged at the (0.05) level.

The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following: $P > 0.05$: Non-significant (NS). $P < 0.05$: Significant (S). $P < 0.01$: Highly significant (HS).

RESULTS

This study was carried out on fifty patients. The age ranged between (21 -47) years with mean ± SD (34.7 ± 5.8) years. the majority of patients was ranged between (30-40) years and (20-30) years by 58% and 24% respectively as shown in Table (1), Figure (13).

Table (1): The Distribution of all studied cases according to Demographic characters:

Age in years:		
	Min. – Max.	21 – 47 years
	Mean ± SD	34.7 ± 5.8
	Median (IQR)	35.0 (31.0 – 38.75)
Age categories: (n=50)		
	20-30	12 (24.0%)
	30-40	29 (58.0%)
	40-50	9 (18.0%)

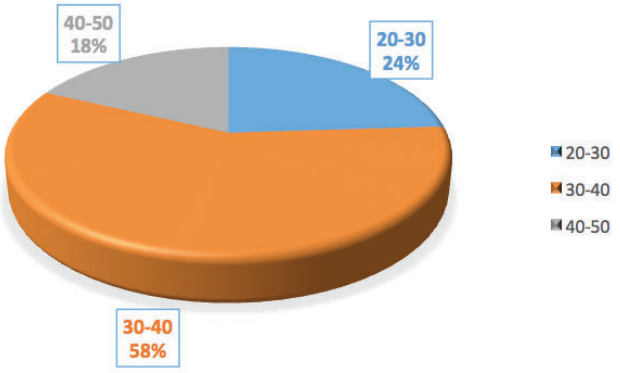

Figure (1): The Distribution of all studied cases according to Age categories

As a regard of parity, the parity distribution in all cases was diagnosed as p3 in 30% (15 patients), p2 in 26% (13 patients), p1 in 18% (9 patients), p4 in 16% (8 patients), p5 in 4% (2 patients) and p8 in 4% (2 patients) as shown in Table (2), Figure (14).

Table (2): The Distribution of all studied cases according to Parity:

Parity: (n=50)		
	p1	9 (18.0%)
	p2	13 (26.0%)
	p3	15 (30.0%)
	p4	8 (16.0%)
	p5	2 (4.0%)
	p6	1 (2.0%)
	p8	2 (4.0%)

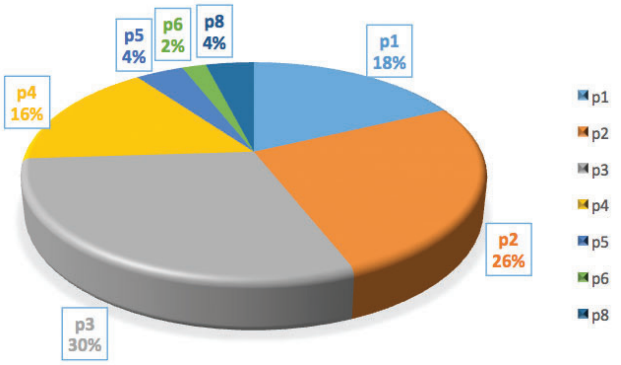

Figure (2): The Distribution of all studied cases according to Parity

The distribution of gravity in all studied cases was shown in Table (3), Figure (15), the most common gravity was 0 in 50% (25 patients) and 1 in 38% (19 patients).

Table (3): The Distribution of all studied cases according to Gravity:

Gravity: (n=50)		
	0	25 (50.0%)
	1	19 (38.0%)
	2	1 (2.0%)
	3	2 (4.0%)
	4	2 (4.0%)
	9	1 (2.0%)

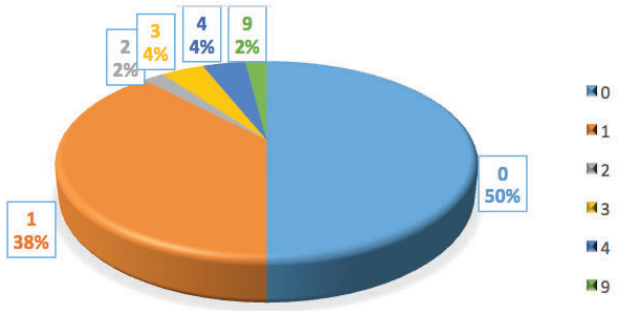

Figure (3): The Distribution of all studied cases according to Gravity

According to the number of caesarian delivery, 20 patients (40%) delivered twice, 16 patients (32%) delivered three times, 10 patients (20%) delivered once while 4 patients (8%) delivered four times as shown in Table (4), Figure (16).

Table (4): The Distribution of all studied cases according to Number of caesarian delivery:

Number of C.S. delivery: (n=50)		
	Once	10 (20.0%)
	Twice	20 (40.0%)
	Three times	16 (32.0%)
	Four times	4 (8.0%)

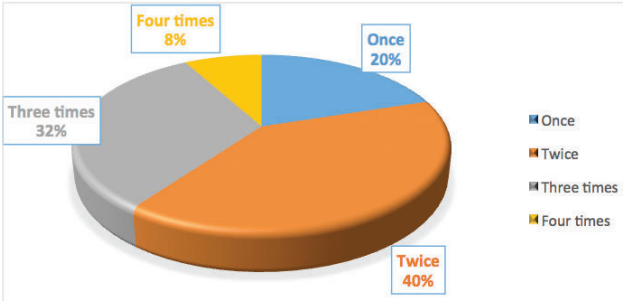

Figure (4): The Distribution of all studied cases according to the number of caesarian delivered

As a regard of HSG niche diagnosis, among 50 patients, 8 patients (16%) were diagnosed as positive while 42 patients (84%) were diagnosed as negative as shown in Table (5), Figure (17).

Table (5): The Distribution of all studied cases according to HSG niche diagnosis:

HSG niche diagnosis:		
	Negative	42 (84.0%)
	Positive	8 (16.0%)

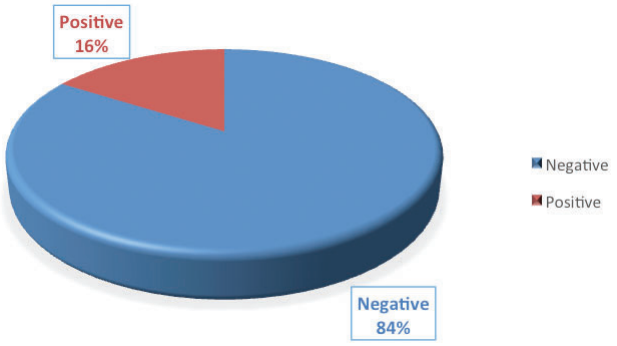

Figure (5): The Distribution of HSG niche diagnosis in all studied cases

As a regard of Hysteroscopy niche diagnosis, all patients (100%) were diagnosed as positive as shown in Table (6).

Table (6): The Distribution of all studied cases according to Hysteroscopy niche diagnosis:

Hysteroscopy niche diagnosis:		
	Negative	0 (0.0%)
	Positive	50 (100.0%)

Studying HSG behavior in the detection of niche diagnosis during patient follow up as a regard of hysteroscopy as a gold standard had an accuracy of 16%. The true positive (TP) cases were 8 patients, true negative (TN) cases were 0 patients while false positive (FP) cases were 0 patients. The diagnostic accuracy was with Sensitivity 16% and Specificity of 0%. HSG had a positive predictive value (PPV) of 100% and a negative predictive value (NPV) of 0% as shown in Table (7).

Table (7): Diagnostic performance of HSG Niche diagnosis as a regard of hysteroscopy niche diagnosis as a gold standard:

Patient-based analysis	Modality	FN	TP	TN	FP	Sensitivity 95% CI	Specificity 95% CI	PPV 95% CI	NPV 95% CI	Accuracy 95% CI	P
All studies n=50	Hysteros-copy/ HSG	42	8	0	0	16% (0.07, 0.29)	0% (0.0, 1.0)	100% (0.63, 1.0)	0% (0.0, 0.08)	16% (0.07, 0.29)	**<0.001***

P: p-value of Fisher's test
*: statistically significant
PPV: positive predictive value
NPV: negative predicative value

DISCUSSION

Main Study Finding: The aim of the study is to evaluate the diagnostic role of HSG in cesarean scar niche diagnosed by hysteroscopy. And the main question to be answered is does HSG can diagnose Cesarean scar niche?

The study was conducted on 50 patients having cesarean scar niche diagnosed early by hysteroscopy to detect to what level of accuracy HCG detect niche.

After data interpretation the study shows that as regards age, the age ranged between (21 -47) years with mean ± SD (34.7 ± 5.8) years. The majority of patients ranged between (30-40) years and (20-30) years by 58% and 24% respectively.

As a regard of parity, the parity distribution in all cases was diagnosed as p3 in 30% (15 patients), p2 in 26% (13 patients), p1 in 18% (9 patients), p4 in 16% (8 patients), p5 in 4% (2 patients) and p8 in 4% (2 patients) with no significant difference.

HSG test has low sensitivity (16%) but high PPV (100%) for detecting this condition, while the hysteroscopy has higher sensitivity (100%) but an undefined specificity and PPV since there are no true negatives. The NPV is 0% for both tests since there are no true negatives.

Comparison with other Literatures: Etman et al. (12) found that regarding the relation between women Demographic data with Niches as diagnosed by Hysterosalpingography showed non-statistically significant differences (p-values >0.05).

Van der Voet et al. (13) found that there was no statistically significant relation between niche as diagnosed by hydrosonography and women demographic data (p=0.44).

In study to Evaluate of uterine scar healing by transvaginal ultrasound in 607 nonpregnant women with a history of cesarean section, Zhou et al. (14) showed that the average age of the two groups of patients was 35.09 ± 5.32 versus 34.00 ± 4.83 years old, and the median age of the two groups was 34 years old. In which there was insignificant difference between both studied groups as regards demographic data.

Bij de Vaate et al. (7) found that there was insignificant difference as regard demographic data (p =0.21).

Mohamed et al. 2021 showed that there was statistical significance between patients with and without niche observed by hysteroscopy regarding age (P value <0.001).

Mohamed et al. (15) showed no statistical significance between patients with and without niche observed by hysteroscopy regarding parity (P value, 0.129).

Hafizi et al. (16) found that there was no significant difference between the cases who detected cesarean scar and who didn't as regard parity (p > 0.05).

Bij de Vaate et al. (7) found that there was insignificant difference as regards obstetric history (p = 0.11).

Van der Voet et al. (13) found that there was insignificant relation between development of niche and number of cesarean section (p =0.55).

Savukyne et al. (18) found that in the patient group with CS scar niches (n = 49) for comparison with the non-niche group (n = 46), there were no statistical differences in the type of delivery. A total of 19 women had successful trials of labor in the niche group and 22 in the non-niche group (38.7% vs. 47.8%, p = 0.802). Fifteen underwent elective repeat Cesarean delivery for various clinical reasons in the niche group, in comparison with 33 women in the non-niche group (31.9% vs. 44.6% p = 0.337). Thirteen women required intrapartum emergency CS because of failed trials of labor in the niche group, versus 19 women in the non-niche group (40.6% vs. 46.3% p = 0.802).

In comparison with hysterography diagnosis of cesarean scar defects, Regnard et al. (18) detected a lower rate of cesarean section scars (57.5%) via hysterosalpingography.

Anter et al. (19) found that HSG was able to detect CS scar defects in 21 cases (55.3%).

In the Indian study by Makrakis et al. 2009, a correspondence of 57.7% was obtained between the HSG and hysteroscopic findings, which are close to the rate observed in our study.

Acholonu et al. (20) found that the sensitivity of hysterosalpingography and hysteroscopy was 58.2% and 91.8%, respectively. The specificity for hysterosalpingography and hysteroscopy was 25.6% and 93.8%. The differences in sensitivity and specificity were both statistically significant.

Hysterosalpingography had a general accuracy of 50.3%, while hysteroscopy had a significantly higher accuracy of 95.5%.

One clear limitation of hysterosalpingography is the inability to precisely measure myometrial thickness and the size of the scar, both of which can be readily characterized via hysterography (21).

In agreement with our results, Cepni et al. (22) revealed 75% sensitivity and 100% specificity of HSG compared to hysteroscopy in the detection of intrauterine adhesions.

Similarly, Hafizi et al. (16) found that sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of HSG in the diagnosis cesarean scar niche of women were 38.78%, 78.57%, 67.86%, 52.38%, and 57.14%, respectively, in comparison with those of hysteroscopy.

Etman et al. (23) found that using hysterosalpingography shown that it can diagnose post-CS niche as compared with hydrosonography with AUC of 0.867, level of sensitivity 83.9%, specificity 89.5%, PPV 92.9%, NPV 77.3% and accuracy 86%.

El-Mazny et al. (24) found that hysterography was comparable to diagnostic hysteroscopy as shown by sensitivity, specificity, +ve predictive value, −ve predictive value and overall accuracy of 87%, 100%, 100%, 95% and 96%, respectively, in the diagnosis of scar defect; and 76%, 100%, 100%, 87% and 91%, respectively, in the diagnosis of intrauterine adhesions.

In a study performed in Babol, north of Iran by Zeinalzadeh et al. (26), sensitivity and specificity were reported as 71.4% and 92.3%, respectively. The specificity reported in the mentioned study was similar to the value obtained in the present study.

The gold standard is to look directly at the uterine cavity and scar tissue using hysteroscopy. However, HSG reveals the extent of the scar formation, while suggesting the presence of intrauterine adhesions. Furthermore, as there is a high correlation between the diagnosis by hysteroscopy and HSG, hysterosalpingography is known as one of the appropriate imaging techniques. HSG is commonly used as a first-line tool in the diagnosis of IUA because it is simple, safe, cost effective, sensitive, and minimally invasive procedure, allowing the visualization of the uterine cavity and tubal patency (26).

CONCLUSION

No sufficient evidence to recommend HSG as a first-line diagnostic tool for cesarean scar niche. However, in healthcare settings without ready access to hysteroscopy HSG may serve as an acceptable alternative as it is well-tolerated, cost-effective, less invasive and doesn't require special training rather than hysteroscopy, but hysteroscopy is still the valuable gold standard for detecting high-probability patients, even asymptomatic.

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