ORIGINAL ARTICLE

Comparative Accuracy of Magnetic Resonance Imaging and Ultrasound in Assessment of Post Cesarean Uterine Scar

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ABSTRACT

Background: The purpose of the study is to compare the ultrasound and MRI diagnostic accuracy for the judgment of lower segment cesarean scar after cesarean for attempting the trial of labor.
Aim: To measure the lower segment scar in pregnant ladies after 37th week by using Trans abdominal ultrasound and MRI
Methodology: This observational case control study was conducted in the Lahore General Hospital Diagnostic Radiology Department from the period Jan 2019 to June 2020.Sample size selected was 40 pregnant ladies with prior cesarean history and want to avail the trial of labor for delivery. The thickness of scar was measured with the help of ultrasound and MRI and was also compared with the results of surgeries. Cut off value was also identified so that the normal scar can be differentiated from abnormal scar and also the comparison was made between the findings of MRI and ultrasound with intra operative results to measure the scar thickness.
Results: The results of the study showed that both imaging modalities have good diagnostic accuracy and no significant difference was observed. From the study the accuracy of ultrasound was observed 96% while the MRI diagnostic accuracy was 90%.The mean age group of the participants were 28.36± 3.28 years. Scar thickness mean calculated from the findings of ultrasound was 3.34 mm ± 1.21 mm and the mean scar measurement from the results of MRI was calculated 3.4 mm± 1.14 mm.
Conclusion: When compared both results in the present study it was found that the ultrasound is more convenient and cost effective option as compared to the MRI and MRI alone don't provide any additional information about the level of scar thickness. The diagnostic accuracy of MRI from the present study was 90% and diagnostic accuracy of Ultrasonography was 96%.
Keywords: MRI, Ultrasound, Cesarean section

INTRODUCTION

Technology has modernized the obstetrics and has increased the number of cesarean section which is very common surgery[1]. The rate of surgical intervention in obstetrics has increased considerably in last few years. Therefore, cases with previous cesarean history have also increased in number and the chances of repeat of the surgeries have also increased .The statistics informed that the 1/3 of surgeries in obstetrics are repeat cesarean sections[2]. The present study helps to reduce the repeated surgeries by calculating the previous scar thickness which helps to opt for vaginal birth after the previous cesarean section. Measurement of scar thickness is important in order to avoid the dehiscence and rupture of the previous scar. Therefore the mode of vaginal deliver or surgery decision is based upon the results of ultrasound and MRI about scar thickness[3]. During trial of labor the emergency surgical option should be well prepared[4]. Due to the presence of risk of rupture of scar after c-section vaginal birth attempts are therefore avoided[5]. It became vital for pregnant women before getting the trial of vaginal birth to diagnose the previous scar thickness. The present study will help to overcome the problem associated with scar thickness measurement. Thickness of previous scar will be measured with the help of MRI and Ultrasound both results will be compared after surgery by calculating the scar thickness with the help of caliper.

The objective of the study is to measure the lower segment scar in pregnant ladies after 37th week by using Trans abdominal ultrasound and MRI to make a comparison of both results with the results of surgical findings.

METHODOLOGY

The present study was conducted in the Diagnostic Radiology Department of Lahore General Hospital from January 2019 to June 2020.The sample size selected for study was 40 pregnant women after 37th week of pregnancy. The study was approved from the ethical committee of the Department and written consent was also obtained from the participants of the study.
Inclusive Criteria: Following was the inclusive criteria of the sample selection
● Women with no previous history of vaginal birth and history of lower segment scar
● Women with history of lower segment scar and are not willing to take the trial of labor
Exclusive criteria:
● Women with multiple cesarean section
● women with history of myomectomy
● previous history of infection in wound
● women who were sensitive to MRI like cochlear implant and any pacemaker were also not included in the study
After the written consent from the participants the patients were assessed for previous medical and surgical history at the start of their last trimester for study purpose.

At and after 37th week of pregnancy ultrasound and MRI was performed in detail to analyze the lower segment scar.

Ultrasound Protocol: The ultrasound machine specification (Andover, MA, USA, iU22; Philips Medical System,) with frequency range 3.5-mhz.The patients were observed under supine position with urinary bladder full. With the help of Trans abdominal transducer thin zone was identified and measurement was taken with cursor. Minimum three readings were obtained.

MRI Protocol: Siemens Avanto, Germany machine was used for MRI at 1.5 tesla.MRI position for the patient was also supine with full filled urinary bladder. With the help of saturation band used on the abdomen the fetal movement artifacts and bowel peristalsis was avoided. The measurement of lower segment scar was obtained with the help of T1 weighted images and T2 weighted images in both sagitial and axial planes.

Surgical scar Protocol: The surgical scar grading protocol was followed developed by the Qureshi et all (5) who divided the grades in four categories.

Grade I scar: Lower segment scar was developed well

Grade II scar: Lower segment scar content was not obvious

Grade III scar: Lower segment scar translucent content were obvious

Grade IV scar: Lower segment scar mark of rupture or dehiscence

From the above grading it is clear that the grade III and IV scars cannot be considered normal and first two grades of scar were considered normal.

RESULTS

Demographic characteristics of the participants were also recorded and provide information about the age, education and financial group of the participants. The mean age group calculated from the sample was 28.36± 3.28 years .The age vary from early 20s to late 30s.The duration between the previous pregnancy and the case under study vary from one year to four years.

Scar thickness mean calculated from the findings of ultrasound was 3.34 mm±1.21mm and the mean scar measurement from the results of MRI was calculated 3.4mm±1.14mm. Diagnostic accuracy of MRI was 90% and Ultrasound was 96% calculated by using SPSS version 20.

Scar thickness measured on MRI and by ultrasound was divided into grades according to the normal range of scar thickness or in abnormal range of scar thickness. Majority of the patients were in the normal range of scar thickness it means they can avail the chance of trial of vaginal birth while 20% of the patients have scar thickness in the abnormal range i.e. is in grade III and they have a risk of rupture of lower segment scar during labor so they were suggested for cesarean section. The minimum scar thickness observed in MRI was 1.9 mm and the maximum scar thickness measured was 5 mm. While the minimum scar thickness in ultrasound was 1.5 mm and the maximum scar thickness measured was 5.4 mm.

When the MRI and ultrasound results were compared with the actual repeat surgical scar thickness measurement with caliper, it was found that intact scar constitute 82% of the patients and dehiscent scar was found in 16% of the cases. Surgical findings were the gold standard and three modalities results have significant coefficient of correlation ($P < 0.05$) measured by SPSS version, 20.

Table 1: Measurement of scar thickness

Scar thickness	MRI	Ultrasound	Cases
Grade I	2.00 mm-5.00 mm	2.2 mm-5.4 mm	20(50%)
Grade II	1.9 mm-4.5 mm	1.5 mm-3.5 mm	12(30%)
Grade III	1.9 mm -5 mm	1.6 mm-4.2 mm	8(20%)
Grade IV	0	0	0
Mean	3.34 mm ± 1.21 mm	3.41 mm± 1.14 mm	
Diagnostic Accuracy	90%	96%	

DISCUSSION

The thickness of the scar was measured by MRI and ultrasound and their results were compared with surgical findings, the information is useful for clinical manifestation and helps in deciding the delivery options in future either to avail the trial of labor or to opt for cesarean section.

It is a fact MRI is an expensive modality and is also not widely available at small set ups. The use of MRI here in the present study was to analyze the diagnostic accuracy and its superiority over the ultrasound for radiological results. From the results it was found the diagnostic accuracy of MRI was 90% while the diagnostic accuracy of ultrasound was found 96% as described in table 1.

From the present study and from literature it was observed that the ultrasonography is the cost effective and accurate method to measure the thickness of lower segment scar with 3.5 mm of threshold as described in table 1. There is also limitation associated with the experience of the Radiologist results may vary from junior

Radiologist and as the experience increases the accuracy also increases. While the images obtained by MRI can be evaluated by Radiologist and the reproducibility is higher in this case. MRI diagnostic accuracy (90%) to isolate the abnormal uterine scar from normal uterine scar is low as compared to the ultrasound (96%).

Many studies were also consulted to get additional information from the literature and publications like a study conducted by Pomorski M, Fuchs T et al[7] has described that ultrasound helps accurately in detecting the uterine scar thickness. He also found ultrasound as a better option for evaluation. A study conducted by Kumar I et al[6] also concluded in his study that the MRI is useful in identifying the complete or partial uterine rupture or dehiscence in postpartum cases but the prediction of lower segment uterine scar for trial of labor is not as accurate as ultrasound. A study conducted by Hoffmann J et al[3,4] for evaluation of MRI where the sample size was also large 164 pregnant women in their last trimester with the history of cesarean section (60) and without any history of

previous cesarean section (104). Axial and sagitial weighted images were obtained to measure the thickness of the uterine scar. The study compared the findings with the operative results and it was found the results in comparison can be varied due to many factors like changes in anatomy and morphology can change the thickness can some time limit the diagnostic images.

Satpathy G et al, Schmitz J et al[8,9] in their studies concluded that MRI and ultrasound when used for measuring the lower segment scar in pregnant women for availing the chance of trial of labor after previous cesarean section USG is more accurate. The study was conducted in university based hospital involving 30 pregnant women and the study also concluded that ultrasound modality has advantage upon MRI slightly due to its accuracy and cost effectiveness.

Seliger G et al[10] in his study elaborated that for measuring the lower segment uterine scar thickness he opted for Trans abdominal ultrasound and Trans vaginal ultrasound. The readings he obtained compared with intra operative findings with caliper and confirmed that the Trans vaginal ultrasound is more accurate as compared to the Trans abdominal ultrasound.

CONCLUSION

From the present study it can be concluded that the ultrasound measurement for lower segment scar was superior as compared to the measurement obtained by the MRI.The diagnostic accuracy of USG is therefore more than MRI. Also USG is a cost effective methods as compared to the MRI which is an expensive investigation.

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