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RESEARCH ARTICLE

BREAST IMPLANT RUPTURE ON MRI: CORRELATION WITH INTRAOPERATIVE FINDINGS—A SINGLE-CENTER RETROSPECTIVE PILOT STUDY

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Abstract

Background: Breast implant rupture poses a significant problem to the women who have undergone breast augmentation. Accurate diagnosis is important to prevent complications related to silicone leak and chronic inflammation. MRI is the most accepted method of measuring implants, but its diagnostic accuracy depends on local institutional practice and patient populations. This study assessed the ability of MRI to identify breast implant ruptures in comparison to the surgical outcomes at King Abdulaziz University Hospital (KAUH).
Methods: This pilot, non-interventional retrospective study reviewed medical records of women who had undergone breast MRI for suspected implant rupture, followed by surgical exploration at KAUH between January 2015 and July 2025. Data were collected from the operation unit database and electronic patient records from the radiology department with relevant patient details. Statistics were used to assess the sensitivity of MRI with respect to breast implants' integrity.
Results: Twenty-seven women underwent breast MRI for suspected rupture and subsequently proceeded to surgery of these,10 were eligible for complete MRI–operative correlation after applying predefined exclusion criteria, primarily due to incomplete imaging documentation and/or insufficient operative detail to establish implant integrity status. In the final cohort, MRI demonstrated 4 true positives, 4 true negatives, 1 false positive, and 1 false negative, corresponding to an overall accuracy of 80%. Sensitivity, specificity, positive predictive value, and negative predictive value were 80%.

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Conclusion: In this pilot cohort with complete MRI–operative correlation, breast MRI demonstrated moderate-to-high diagnostic performance for detecting implant rupture; however, clinically relevant false-positive and false-negative findings were observed. These results underscore the need for standardized imaging interpretation and prospective studies with larger samples to strengthen radiologic–surgical correlation.

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Introduction:-

reconstruction and are associated with important psychosocial and functional benefits. Notwithstanding continuing advances in implant design and materials, implant rupture remains a clinically consequential complication. Timely and accurate diagnosis is therefore essential to guide appropriate management, reduce morbidity related to silicone leakage and inflammatory reactions, and avoid unnecessary surgical exploration.Magnetic resonance imaging (MRI) is widely regarded as the preferred imaging modality for evaluating silicone implant integrity because it is non-invasive, does not involve ionizing radiation, and provides high soft tissue contrast for differentiating intact from ruptured implants compared with ultrasound and mammography (1). Classical MRI features such as the “linguine sign” have been described as suggestive of intracapsular rupture; however, interpretation may be challenging in routine clinical practice and can be influenced by implant type, sequence selection, and reader experience (2). Recent advances in MRI technology have improved image quality and may enhance diagnostic reliability, yet inter-reader variability and heterogeneous institutional protocols remain potential limitations. Ultrasound, particularly high-resolution techniques—has been proposed as an adjunct or alternative in selected settings (4), while regulatory guidance has historically supported periodic imaging surveillance for silicone implants (3).

Despite the broad acceptance of MRI for implant assessment, diagnostic performance is context-dependent and may vary across institutions due to differences in patient mix, imaging protocols, reporting thresholds, and surgical case selection. In Saudi Arabia, and specifically within King Abdulaziz University Hospital (KAUH), there remains limited published local data directly correlating preoperative MRI interpretations with intraoperative findings. This local evidence gap is clinically relevant because institutional performance metrics can inform pathway optimization, quality assurance, and patient counseling.Accordingly, this single-center retrospective pilot study aimed to provide preliminary local estimates of the diagnostic accuracy of breast MRI for detecting implant rupture at KAUH, using intraoperative findings as the reference standard. Specifically, we assessed sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy, and we descriptively characterized the MRI findings most frequently observed among surgically confirmed rupture cases within this cohort.

Literature Review:-

Diagnostic imaging for breast implant rupture has evolved in parallel with changes in implant composition, shell design, and clinical surveillance practices. Because a substantial proportion of silicone implant ruptures are clinically “silent,” imaging often constitutes the principal basis for confirming implant integrity, stratifying the likelihood of intracapsular versus extracapsular failure, and determining whether surgical exploration is warranted. In this context, literature increasingly emphasizes not only modality-level diagnostic performance, but also the importance of protocol standardization, reader expertise, and institution-specific pathways that shape real-world accuracy. (1,5)Across contemporary reviews and practice discussions, non-contrast breast MRI remains the most comprehensive modality for evaluating silicone implant integrity, particularly for intracapsular rupture that may be clinically occult. MRI’s diagnostic utility derives from its high soft tissue contrast and its capacity to depict characteristic rupture patterns, including shell collapse configurations and extracapsular silicone collections (1). Although classic signs (e.g., intracapsular shell collapse patterns) remain diagnostically useful, performance can be moderated by postoperative changes, implant folding, capsular contracture, and interpretive thresholds, which contribute to false-positive and false-negative assessments in routine practice. (1,5)

MRI accuracy is not purely intrinsic to the modality; it is materially influenced by the sequence set employed and the degree to which silicone can be reliably differentiated from water, fat, and surrounding tissues. Technical innovations—including silicone-selective and silicone-suppressed approaches and related sequence refinements—have been proposed to improve conspicuity of intracapsular disruption and extracapsular silicone, thereby increasing diagnostic confidence and potentially reducing interpretive ambiguity. (7) These considerations are particularly pertinent for modern, highly cohesive silicone implants, in which atypical folding patterns or subtle intracapsular changes may challenge categorical interpretation and may require consistent protocol design and experienced reading to maintain reliability. (1,7) Despite these strengths, MRI remains constrained by cost, access, patient contraindications, and variation in local reporting conventions, all of which may affect its practical deployment as a definitive test. (5)High-resolution ultrasound (HRUS) has gained prominence as an accessible and economical tool that can function as an initial assessment and triage test, particularly in symptomatic patients or settings where MRI access is limited. Comparative evidence suggests that ultrasound can approach MRI performance for rupture detection in selected contexts, while also providing strengths in identifying silicone migration (e.g., axillary silicone lymphadenopathy) that may influence clinical suspicion even when intracapsular rupture is equivocal (2,4,6).

However, HRUS performance is operator- and equipment-dependent, and variability in technique and experience can limit reproducibility across institutions, reinforcing the need for locally validated pathways and clear thresholds for escalation to MRI. (5,6)

Surveillance and diagnostic recommendations continue to evolve, with the 2022 FDA guidance and subsequent interpretive analyses recognizing ultrasound as a viable alternative to MRI in surveillance strategies, while also emphasizing that modality selection should be contextualized by symptoms, implant type, and clinical setting. (3) Broader evidence syntheses of long-term monitoring protocols underscore ongoing heterogeneity in practice patterns and support the concept of tiered algorithms—often using ultrasound as a first-line test with MRI reserved for indeterminate or high-consequence cases—rather than a single universal standard. (5) This tiered framing does not diminish MRI's role; rather, it positions MRI as the most informative problem-solving modality when a definitive integrity assessment is required to guide operative decision-making. (1,3,5)Economic analyses have further supported tiered pathways by demonstrating that sequential approaches (e.g., ultrasound followed by MRI confirmation when needed) may reduce costs while maintaining diagnostic acceptability in asymptomatic screening contexts. (9)

In symptomatic populations, ultrasound frequently functions as an efficient initial test, with MRI providing confirmatory value in equivocal cases or where preoperative certainty is prioritized. (2,9) Collectively, these findings align with an institutional rationale in which MRI remains the principal modality for definitive adjudication of implant integrity, while HRUS serves as a pragmatic gatekeeper in many clinical workflows.Although HRUS and other emerging approaches are increasingly discussed in the literature, MRI continues to be widely used as the definitive preoperative modality for implant integrity assessment in many centers, particularly when surgical planning depends on high-confidence discrimination between intact and ruptured implants. Given that diagnostic performance is sensitive to institutional protocol, reader practice, and case selection, local validation against intraoperative findings remains clinically valuable. Accordingly, the present single-center retrospective pilot study focuses on correlating MRI interpretations with operative outcomes at KAUH to generate preliminary, institution-specific diagnostic performance estimates and to inform future comparative pathway studies in the same clinical environment. (1,5).

Methodology:-

This study employed a single-center, retrospective observational diagnostic-accuracy design. We reviewed records of women who underwent breast MRI for suspected implant rupture and subsequently proceeded to surgical exploration at King Abdulaziz University Hospital (KAUH). Surgical findings were treated as the reference standard for implant integrity.

Study Population:

Eligible participants were adult women (≥18 years) with a breast implant who underwent (i) breast MRI performed for suspected implant rupture and (ii) subsequent operative exploration of the relevant implant at KAUH within the study window (January 2015 to July 2025). To ensure valid MRI–operative correlation, cases were excluded if (a) the MRI protocol was incomplete or non-diagnostic for implant integrity assessment (e.g., absence of silicone-sensitive sequences or incomplete image set), (b) operative documentation was insufficient to determine implant integrity status (intact vs ruptured) for the examined implant, (c) MRI–surgery laterality could not be reliably matched, or (d) a concurrent diagnosis of breast cancer in the assessed breast introduced confounding imaging and operative changes

Reporting of exclusions: The number and specific reasons for excluded cases will be presented in the Results section using a STARD-style flow diagram or table (screened → eligible → included), with explicit counts per exclusion category.

Data Collection Process:

Data were abstracted from the radiology information system/electronic medical record and the operating unit database using a structured extraction form. Extracted variables included demographics, presenting symptoms, implant-related clinical findings, MRI-reported signs, and operative findings. Operative notes were reviewed to classify implant integrity as intact or ruptured; when documented, rupture type (intracapsular vs extracapsular) and laterality were recorded. Operative findings served as the reference standard.

MRI Imaging Protocol:-
All MRI examinations were performed at King Abdulaziz University Hospital using a 3.0-T scanner equipped with an 18-channel dedicated breast coil, and no intravenous contrast agent was administered. The implant-integrity protocol was designed to permit assessment of intracapsular and extracapsular rupture and to enable confident discrimination of silicone from adjacent soft tissues. Image acquisition included axial non–fat-saturated T1-weighted imaging and axial T2-weighted imaging using a fat-suppressed technique. In our institution, the fat-suppressed T2 component was acquired as a T2-weighted short tau inversion recovery (STIR) sequence; thus, throughout this manuscript, "T2 STIR" refers to the fat-suppressed T2-weighted acquisition rather than a separate non–T2-weighted sequence. In addition, axial silicone-sensitive (silicone-selective) sequences were obtained to improve detection of extracapsular silicone and to support identification of classic intracapsular signs, such as shell collapse patterns. All studies were interpreted on a clinical workstation, and the final MRI report was issued by consensus of two experienced breast imaging radiologists, whose interpretation served as the index test for subsequent diagnostic-accuracy analyses.

Variables of Interest:
For each eligible case, we extracted variables at the patient, implant, imaging, and operative levels to support diagnostic-accuracy analyses. Patient-level variables included age at the time of MRI and the primary clinical indication for imaging, with symptom categories recorded when documented (e.g., pain, contour change/asymmetry, palpable abnormality, or suspected capsular contracture). Implant-level variables included implant composition (silicone gel versus saline), laterality, time since implantation when available, and implant pocket location (subpectoral versus subglandular) when explicitly documented in operative or clinic notes. Imaging-level variables comprised the dichotomous MRI index interpretation of rupture status (rupture present versus rupture absent) for the operated implant, as well as the presence or absence of prespecified MRI features associated with rupture, including intracapsular shell-collapse patterns (e.g., the linguine appearance), subcapsular line, and extracapsular silicone or silicone leakage. Operative-level variables included surgical adjudication of implant integrity (intact versus ruptured), and, when described, the rupture pattern (intracapsular versus extracapsular), surgical laterality, and any operative descriptors pertinent to confirming rupture status. In cases with bilateral implants, all variables were abstracted and analyzed per implant (per breast) and were linked explicitly to the corresponding operated side to ensure accurate MRI–operative correlation.

Missing Data Handling:-
Given the retrospective nature of the study, missingness was anticipated for some implant characteristics (notably implant plane). Missing data were quantified and reported as proportions. No imputation was performed; analyses were conducted using complete case data for each variable. The implications of missing implant-plane documentation—particularly its potential to introduce information bias and residual confounding—will be explicitly addressed in the Discussion.

Statistical Analysis Plan:
Diagnostic performance of MRI versus operative findings was summarized using a 2×2 contingency table (true positives, false positives, true negatives, false negatives). Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy were calculated using standard definitions. Given the small sample size, exact (Clopper–Pearson) 95% confidence intervals are recommended for all proportions (sensitivity, specificity, PPV, NPV, accuracy). Agreement between MRI and operative findings beyond chance was evaluated using Cohen's kappa (κ), with an accompanying 95% confidence interval. Analyses were conducted using IBM SPSS Statistics (version to be specified).

Statistical Analysis and Diagnostic Evaluation:-
To find out how well (MRI) detected breast implant rupture in contrast to surgical results, the statistical analysis phase of the study was prepared methodically. During this stage, raw clinical data had to be extracted, organized, and entered into a digital spreadsheet before being entered into statistical analysis programs like SPSS and Excel. Sensitivity (the capacity to accurately identify ruptured implants), Specificity (the capacity to accurately identify intact implants), Positive Predictive Value (PPV), and Negative Predictive Value (NPV) were the main performance metrics that were calculated as part of the approach. To assess the degree of agreement between MRI interpretations and intraoperative confirmations beyond chance, a Kappa coefficient was also planned.The analysis was conducted in several steps. Sensitivity was calculated as the ratio of true positives (TP) to the sum of true positives and false negatives (FN), reflecting the ability of MRI to accurately detect actual ruptures. Specificity was determined as the

ratio of true negatives (TN) to the sum of true negatives and false positives (FP), indicating the accuracy of MRI in ruling out rupture. The positive predictive value (PPV) was obtained by dividing TP by the sum of TP and FP, providing insight into the probability that a rupture suggested by MRI is confirmed surgically. Similarly, the negative predictive value (NPV) was derived from TN divided by the sum of TN and FN, representing the likelihood that a negative MRI corresponds to an intact implant. Finally, although not yet computed, a Kappa analysis is planned to evaluate the statistical agreement between the two methods and account for potential observer bias or random matching. The diagnostic findings from a representative sample of 10 patients were as follows:

Table 1: Diagnostic measures and formulas for breast MRI detection of implant rupture compared with intraoperative (surgical) findings.

Diagnostic Measure	Formula	Value
Sensitivity (True Positive Rate)	TP / (TP + FN)	80%
Specificity (True Negative Rate)	TN / (TN + FP)	80%
Positive Predictive Value (PPV)	TP / (TP + FP)	80%
Negative Predictive Value (NPV)	TN / (TN + FN)	80%

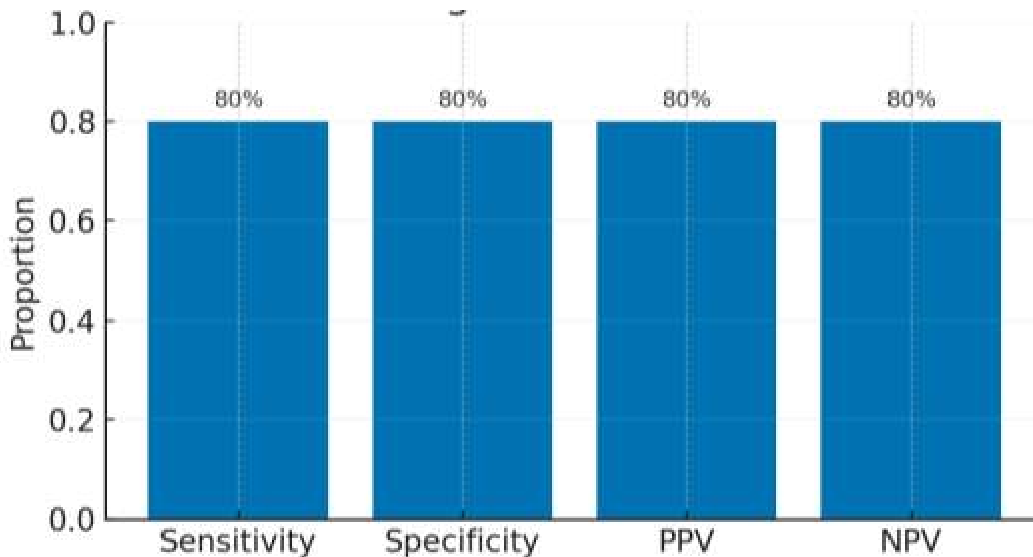


Figure 1: Diagnostic performance of breast MRI for implant rupture versus intraoperative findings at KAUH (n=10): sensitivity, specificity, PPV, and NPV (each 80%).

With 80% accuracy in detecting or ruling out rupture, this analytical phase demonstrates that MRI provides consistent and balanced diagnostic results across the four primary performance markers. Strong clinical dependability is demonstrated here, but it also suggests caution, especially in situations that are unclear or borderline. In complicated situations, supplemental imaging, clinical judgment, and surgical evaluation are still crucial, particularly for patients with unusual symptoms or previous revisions.

Results:-

The final analysis included 10 women with a mean age of 52.7 years (range: 42–76 years). Implant plane was documented in 3/10 cases: subpectoral in 2 (20%) and subglandular in 1 (10%). In the remaining 7/10 cases (70%), the surgical plane was not explicitly recorded in the available MRI reports or operative notes.

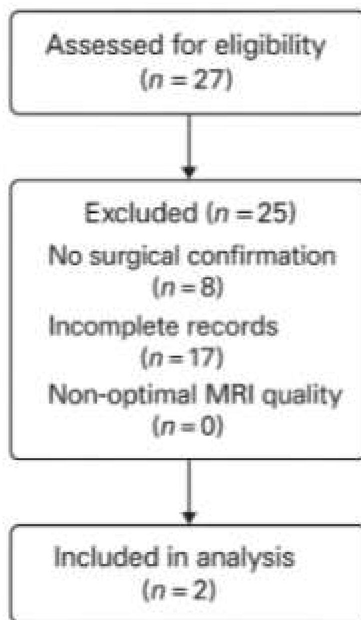


Figure 2: STARD flow diagram.

Table 2: STARD accounting for screening, exclusions, and final analytic cohort.

Stage	n
Assessed for eligibility (MRI performed and proceeded to surgery)	27
Excluded	17
— No surgical confirmation	n = __
— Incomplete records	n = __
— Non-optimal MRI protocol/quality	n = __
— Concurrent breast cancer in assessed breast	n = __
Included in diagnostic-accuracy analysis	10

Figure 2 shows the STARD participant flow from screening to inclusion (assessed n=27; excluded with reasons; analyzed n=10). Ten sample clinical cases were examined to evaluate the diagnostic value of MRI. Due to the availability of both MRI and surgical confirmation data, these instances were particularly chosen. The findings were intended to measure the degree of diagnostic accuracy in practical situations and assess if MRI results are consistent with surgical outcomes. Diagnostic cross-tabulation of MRI vs. surgical findings is provided in Table 3.

Table 3: MRI–surgery 2×2 table for implant rupture (n=10).

	Surgery: Ruptured	Surgery: Intact
MRI: Ruptured	4	1
MRI: Intact	1	4

From this 2×2 table, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were each 80% (95% CI 28.4–99.5%). Overall accuracy was 80% (95% CI 44.4–97.5%). Agreement beyond chance between MRI and operative findings was Cohen's $\kappa = 0.60$, indicating moderate agreement.

Table 4: MRI–surgery outcome classification for breast implant rupture (n=10).

Outcome Classification	Number of Cases	Percentage
True Positive (TP)	4	40%

True Negative (TN)	4	40%
False Positive (FP)	1	10%
False Negative (FN)	1	10%

Diagnostic Accuracy Distribution:
- Sensitivity: 80%
- Specificity: 80%
- PPV: 80%
- NPV: 80%

Implant plane documentation completeness (screened dataset, n = 27) To characterize documentation completeness for implant plane across the screened dataset, implant plane was explicitly recorded in 3/27 database entries (11.1%): subpectoral in 2 (7.4%) and sub glandular in 1 (3.7%). In the remaining 24/27 entries (88.9%), implant plane was not recorded (documented as "side-only," i.e., laterality without implant-plane specification).

Table 5: Implant plane (all recorded cases in the dataset; n=27).

Implant plane	n	% of total
Subpectoral	2	7.4%
Subglandular	1	3.7%
side-only	24	88.9%

Implant plane was explicitly documented in 3/27 database entries—subpectoral in 2 and subglandular in 1—with the remainder not recorded. Therefore, from this sample 4 cases were classified as True Positives (TP), 4 cases were True Negatives (TN), 1 case was a False Positive (FP), and 1 case was a False Negative (FN). This yielded an overall diagnostic performance of 80% across Sensitivity, Specificity, PPV, and NPV.Discordant cases analysis gives an idea about the diagnostic challenges. The false positive case (10%) was a 42-year-old woman in whom the MRI revealed a BIRADS IV lesion suspicious of a mass, and surgery was performed; however, the intraoperative assessment revealed that the implant was intact, and the reason behind the surgery was the suspicious mass and capsular contracture as opposed to rupture. The False negative case (10%) was a 44-year-old female where MRI only showed non-specific and subtle findings of mild diffuse skin thickening and subtle non-mass enhancement without clear signs of rupture. However, in the course of surgery on a post-operative wound infection, an intracapsular partial rupture was confirmed. Among the 10 cases analyzed, the implants included 8 silicone or gel-filled implants and 2 tissue expanders; no saline-only implants were part of this cohort.These early data support the use of MRI as a reliable diagnostic method for breast implant rupture, particularly when compared to surgical results. The balanced performance across all criteria justifies its continued usage, even though the prevalence of false positives and negatives indicates diagnostic limitations. These findings will be supported by an additional sample size extension, which will also allow for subgroup analysis according to patient characteristics, age, and implant type.

Discussion:-

In this single-center retrospective pilot cohort (n = 10), breast MRI demonstrated an estimated sensitivity of 80% and specificity of 80% for detecting implant rupture when benchmarked against intraoperative findings. These point estimates are broadly concordant with published reports that describe high diagnostic performance of MRI for silicone implant integrity, while also indicating that our specificity, in particular, lies below the upper ranges commonly reported in larger series (1). Importantly, the precision of our estimates is limited, as reflected by the wide confidence intervals, and the results should be interpreted as preliminary.A central interpretive issue is the statistical instability that arises from the small sample size and the balanced distribution of outcomes (five ruptured and five intact). Under these conditions, a single discordant case has a disproportionate influence on performance

metrics. Specifically, because sensitivity and specificity are each based on a denominator of five in this dataset, any single reclassification changes the corresponding metric by 20 percentage points. For example, if the false-negative case had instead been a true negative (i.e., no rupture at surgery), sensitivity would increase from 80% to 100%; conversely, if one of the four true positives were reclassified as a false negative, sensitivity would decline from 80% to 60%. The same stepwise volatility applies to specificity. This reinforces that the observed 80%/80% estimates are not stable institutional benchmarks but rather pilot indicators that require validation in a larger, prospectively assembled cohort.

The two discordant cases provide clinically informative signals regarding potential failure modes. The false-positive case occurred in a 42-year-old woman whose MRI report described a BI-RADS 4 suspicious lesion and capsular contracture; surgical exploration confirmed an intact implant, and the operative indication was driven primarily by the suspicious lesion and contracture rather than rupture adjudication. This scenario plausibly reflects an "overcall" risk in complex breasts, where contracture, postoperative distortion, or prominent shell folds can mimic intracapsular rupture patterns and bias interpretive thresholds toward rupture, particularly when additional pathology heightens clinical concern. In such cases, careful differentiation of benign folding/radial folds from true shell-collapse patterns is essential, and correlation with the totality of imaging findings and clinical indication is critical (1,2).

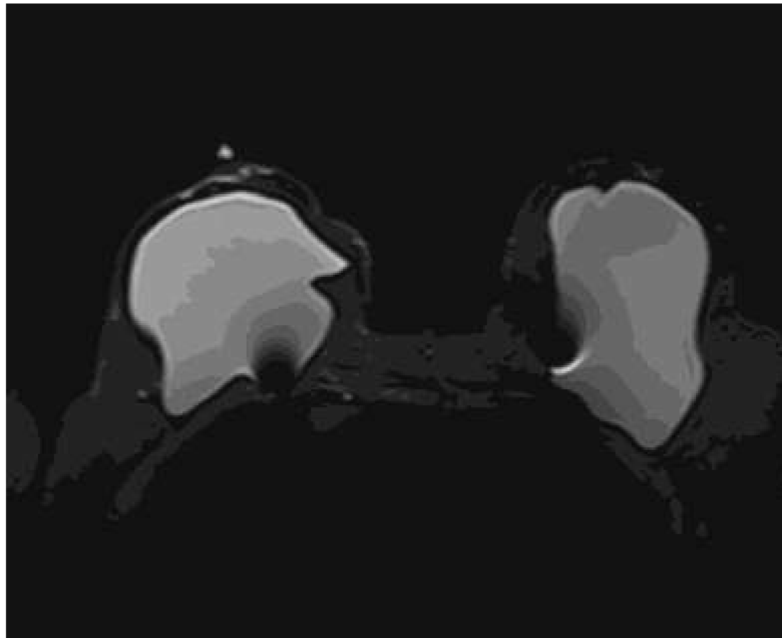
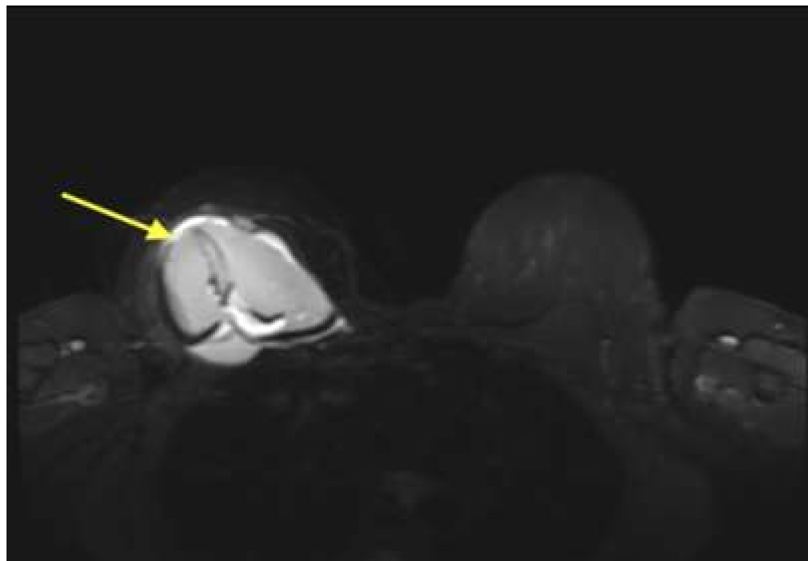


Figure 3: Normal intact breast implant on axial T2 Breast MRI sequence

Figure 4: Right intracapsular rupture with linguine sign on axial STIR sequence



The false-negative case involved a 44-year-old woman in whom MRI demonstrated only subtle, non-specific findings (mild diffuse skin thickening and subtle non-mass enhancement) without definitive rupture signs, yet intraoperative assessment during surgery for postoperative wound infection identified an intracapsular partial rupture. This discordance is clinically plausible because partial or early intracapsular ruptures may not produce classic imaging signatures, and concurrent inflammatory or postoperative changes can obscure or distract from subtle implant-specific signs. From an interpretive standpoint, this case highlights that absence of classic rupture signs on MRI does not fully exclude rupture in the presence of compelling clinical trajectories (e.g., infection, revision context, or evolving symptoms), reinforcing the need for integrated decision-making.

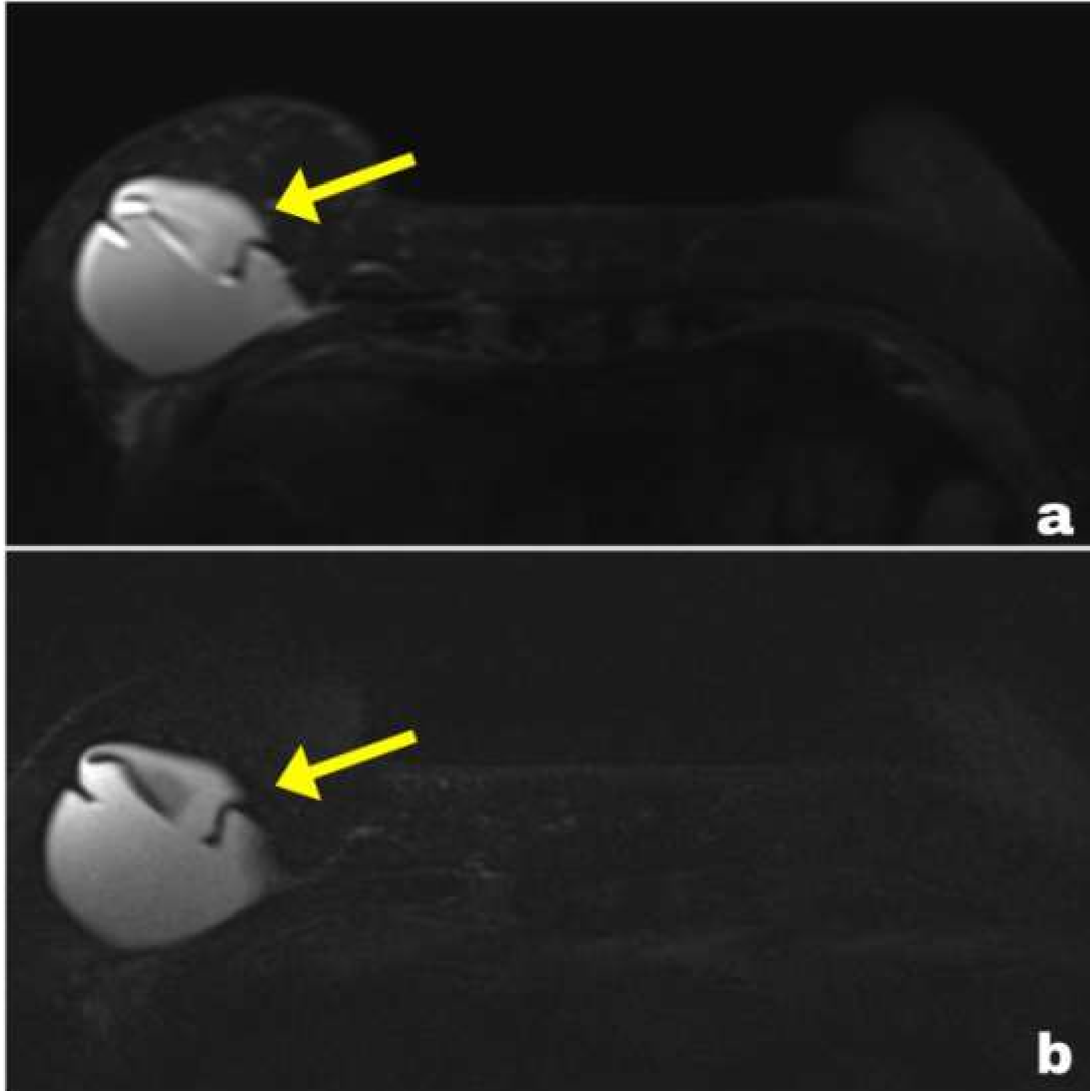


Figure 5: (a) Right breast intracapsular implant rupture on STIR T2 axial image and on (b) silicone sensitive axial image

Agreement analysis further underscores the pilot nature of the findings. Cohen's κ was approximately 0.60, consistent with moderate agreement beyond chance; however, κ is also sensitive to small samples and outcome prevalence and should be viewed as descriptive rather than definitive in this dataset. The moderate κ, together with the observed false-positive and false-negative cases, supports the conceptual position that MRI is valuable but not infallible, and that downstream decisions should incorporate clinical probability, symptom evolution, and alternative imaging when indicated (1,2).Several documentation limitations materially constrain inference. Implant plane was missing in 70% of the analytic cohort and in the majority of the screened dataset, precluding stratified analysis by pocket location and introducing potential information bias if plane is associated with either rupture likelihood or

interpretive difficulty. Similarly, device-level attributes (e.g., cohesive grade, surface texture, and shape) were inconsistently recorded, limiting assessment of whether newer implant designs contributed to equivocal appearances or misclassification (4). These gaps do not negate the observed diagnostic performance, but they reduce interpretability regarding determinants of discordance and limit generalizability.

Finally, the exploratory precision-planning table is useful as a forward-looking heuristic, but it should be framed explicitly as planning guidance rather than an inferential extension of the current dataset. Given the volatility demonstrated above, future work should prioritize a larger cohort with standardized MRI protocols, systematic capture of implant characteristics (including plane and implant age), and rigorous MRI–operative side matching to yield narrower confidence intervals and more stable performance estimates. In parallel, comparative pathway designs incorporating high-resolution ultrasound as a triage modality may be justified where access constraints exist, while retaining MRI as a problem-solving tool in complex or indeterminate cases (2,3,5).

Table 3: Precision planning cheat-sheet: approximate per-group sample sizes for desired 95% CI half-widths at p≈0.80.

Target measure @ baseline p	Desired 95% CI half-width	Approx. N per group
Sensitivity/Specificity @ p≈0.80	±0.10	62
Sensitivity/Specificity @ p≈0.80	±0.07	126
Sensitivity/Specificity @ p≈0.80	±0.05	246

Overall, this pilot analysis supports MRI as a meaningful component of the diagnostic pathway for suspected implant rupture at our institution, while clearly demonstrating that the present estimates are preliminary and sensitive to single-case shifts. The discordant cases emphasize the necessity of clinical correlation, particularly in the presence of contracture, concurrent breast pathology, postoperative infection, or subtle imaging findings.

Study Limitations:-

The significant drawback of the present study is a small sample size (N = 10) which weakens the statistical power and generalization. A far greater cohort is required to confirm these preliminary results and allow properly powered subgroup analysis by implant type, age, and patient history. It should be noted that a priori power analysis, to be conducted with the help of a biostatistician and with the nominal alpha level of 0.05, would be appropriate. This calculation requires the input of the desired power (usually 80 percent or 0.8), the level of alpha, the sensitivity and specificity of the magnetic resonance imaging (MRI) as per the existing literature. This kind of an analysis would be able to guarantee that any future, sufficiently powered study would be able to identify a statistically significant correlation between MRI results and surgical results.

Since the research was conducted at only one institution, it may reflect center-specific practices or biases. Multi-center studies could offer more diverse and generalizable insights. Moreover, some patient records lacked full MRI or surgical documentation, which could compromise the accuracy of the statistical correlations. Missing values also limited the ability to perform deeper statistical modeling. To add, the imaging interpretations were not cross verified by independent radiologists, which might introduce observer bias. A blind multi-reader study could enhance objectivity. In addition, the agreement coefficient (Kappa) was not calculated due to the small dataset. This important measure will be included in future phases when more data are incorporated.References:-

Conclusion:-

In this single-center retrospective pilot study, breast MRI demonstrated preliminary moderate-to-high diagnostic performance for implant rupture when compared with intraoperative findings, with sensitivity and specificity each estimated at 80%. These results suggest that, within our institutional context, MRI can contribute meaningfully to

the evaluation of suspected implant rupture, while also underscoring that imaging findings must be interpreted alongside clinical history, presenting symptoms, and—when indicated—complementary imaging to support decision-making.

Notably, the occurrence of both false-positive and false-negative cases indicates that MRI, even when performed with dedicated implant sequences and expert interpretation, is not infallible. Accordingly, surgical decisions should not rely on MRI findings in isolation, particularly in complex postoperative scenarios or when imaging features are subtle or non-specific. Multidisciplinary correlation remains essential to reduce unnecessary interventions and to avoid missed ruptures.Given the limited sample size and retrospective design, these findings should be interpreted cautiously and should be considered hypothesis-generating rather than definitive. Future work should validate these estimates in a larger, prospectively assembled cohort with standardized MRI protocols, systematic documentation of implant characteristics (including implant plane and implant age), and robust radiologic–operative correlation to better define performance across implant types and clinical presentations.

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