Molina Clinical Policy
Thermography and Breast Specific Gamma Imaging for the Detection of Breast Lesions: Policy No. 127

Last Approval: 8/9/2023
Next Review Due By: August 2024

DISCLAIMER

This Molina Clinical Policy (MCP) is intended to facilitate the Utilization Management process. Policies are not a supplementation or recommendation for treatment; Providers are solely responsible for the diagnosis, treatment, and clinical recommendations for the Member. It expresses Molina's determination as to whether certain services or supplies are medically necessary, experimental, investigational, or cosmetic for purposes of determining appropriateness of payment. The conclusion that a particular service or supply is medically necessary does not constitute a representation or warranty that this service or supply is covered (e.g., will be paid for by Molina) for a particular Member. The Member's benefit plan determines coverage – each benefit plan defines which services are covered, which are excluded, and which are subject to dollar caps or other limits. Members and their Providers will need to consult the Member's benefit plan to determine if there are any exclusion(s) or other benefit limitations applicable to this service or supply. If there is a discrepancy between this policy and a Member's plan of benefits, the benefits plan will govern. In addition, coverage may be mandated by applicable legal requirements of a State, the Federal government or CMS for Medicare and Medicaid Members. CMS's Coverage Database can be found on the CMS website. The coverage directive(s) and criteria from an existing National Coverage Determination (NCD) or Local Coverage Determination (LCD) will supersede the contents of this MCP and provide the directive for all Medicare members. References included were accurate at the time of policy approval and publication.

OVERVIEW

Thermography measures emanating heat signatures from the surface of the skin utilizing infrared technology and displays the temperature signatures in the form of a colored heat graph. Warmer regions of skin may indicate the presence of precancerous tissue or tumors, as tumor development is associated with increased heat due to angiogenesis, increased metabolism, and other physiologic changes. Thermography is a screening rather than a diagnostic test; therefore, a diagnosis of breast cancer must be confirmed with a biopsy. While thermograph devices are used in breast cancer screening, it is only FDA approved as an adjunct to the gold standard of mammography (Rakhunde et al. 2022).

Breast-specific gamma imaging (BSGI) also called Molecular Breast Imaging (MBI) is a nuclear medicine imaging technique, based on physiologic principles, that utilizes a special camera to evaluate the differential uptake of injected radioactive tracer Technetium TC 99M Sestamibi which tends to accumulate in malignant breast tissue due to increased vascularity and mitochondrial activity. The sensitivity of BSGI is not affected by breast tissue density, breast implants, or scars, unlike mammography; and has repeatedly shown to be as effective, if not more, in detecting breast lesions when compared to mammography, MRI, and ultrasound. BSGI is used in conjunction with mammography to confirm suspicious lesions and/or in surgical planning post breast cancer diagnosis. Current research is delving into BSGIs role in assessing treatment response in women undergoing neo-adjuvant chemotherapy, and as an adjuvant screening tool in women with dense breasts.

Regulatory Status

Thermography: In 1982 the FDA approved thermography for breast cancer screening as a safe adjunct to mammography. The FDA spoke to its safety, not its efficacy in producing quality screening results. In 2021 the FDA issued a consumer update emphasizing that a thermogram was no substitute for a mammogram (FDA 2021). There are multiple FDA approved thermography devices on the market intended for “viewing and recording heat patterns generated by the human body” and is approved for “adjunctive diagnostic screening for detection of breast cancer and diseases affecting blood perfusion or reperfusion of tissue or organs”. Examples of cleared thermography devices are FirstSense Breast Exam (First Sense Medical) and NoTouch Breastscan (UE LifeSciences Inc). For information on additional products, search product code IYM [telethermographic system] or LHQ [telethermographic system for adjunctive use] in the FDA 510(k) Premarket Notification Database.

Breast-specific gamma imaging (BSGI): Multiple scintillation (gamma) cameras have been cleared through the FDA 510(k) process for marketing products for the indication of “measuring and imaging the distribution of radionuclides by means of photon detection in order to aid in the evaluation of lesions in the treat tissues and other small body parts.” Examples of cleared scintillation (gamma) cameras are Dilon 6800 (Dilon Technologies) and LumaGEN (Gamma Medical). For information on additional products, search product code IYX or by applicant name in the FDA 510(k) Premarket Notification Database.

Technetium TC 99M Sestamibi (Cardinal Health 414, Curium, Jubilant Draximage) is FDA approved for breast imaging under the following label "Breast Imaging: Technetium TC 99M Sestamibi is indicated for planar imaging as a second-

line diagnostic drug after mammography to assist in the evaluation of breast lesions in patients with an abnormal mammogram or a palpable breast mass. Technetium TC 99M Sestamibi is not indicated for breast cancer screening, to confirm the presence or absence of malignancy, and it is not an alternative to biopsy." For information on additional Technetium TC 99M Sestamibi drug approvals search Drugs@FDA: FDA – Approval Drugs database.

COVERAGE POLICY

Thermography (also referred to as digital infrared thermal imaging [DITI]) and temperature gradient studies for the diagnosis of breast lesions **is considered experimental, investigational, and unproven** due to insufficient clinical evidence to determine whether the sensitivity and/or specificity of diagnosis improved when thermography was combined with mammography, or whether breast thermography improves health outcomes.

Breast specific gamma imaging (BSGI) (also known as molecular breast imaging or scintimammography) for the diagnosis of breast lesions **is considered experimental, investigational, and unproven** as the available evidence has not conclusively demonstrated that BSGI is more effective than ultrasound (US) or MRI for evaluation of suspicious breast lesions detected by mammography or clinical breast examination.

DOCUMENTATION REQUIREMENTS. Molina Healthcare reserves the right to require that additional documentation be made available as part of its coverage determination; quality improvement; and fraud; waste and abuse prevention processes. Documentation required may include, but is not limited to, patient records, test results and credentials of the provider ordering or performing a drug or service. Molina Healthcare may deny reimbursement or take additional appropriate action if the documentation provided does not support the initial determination that the drugs or services were medically necessary, not investigational, or experimental, and otherwise within the scope of benefits afforded to the member, and/or the documentation demonstrates a pattern of billing or other practice that is inappropriate or excessive.

SUMMARY OF MEDICAL EVIDENCE

Breast Thermography

Morais et al. (2016) conducted a retrospective review of thermographic images and subjected the images to structured methodical calculations to evaluate the sensitivity of thermographic screening. The authors analyzed images belonging to 47 participants that were diagnosed with breast cancer via biopsy against images belonging to 101 women with lesion free breasts confirmed via mammography. The analysis resulted in thermography detecting 45 of the 47 known breast cancer cases. The authors did not address if there were false positives in the control group. The limitations of this study are small sample size, and high risk of bias.

Omranipor et al (2016) conducted a prospective study comparing mammographic versus thermographic images in 132 women found to be candidates for breast biopsy based on clinical examination and medical history. The median age of the participants was 49.5 ± 10.3 years and the final pathological result yielded 87 malignancies and 45 benign lesions. The images were analyzed blind to biopsy results. Mammography revealed an 80.5% sensitivity rate, a 73.3% specificity rate, 85.4% positive predictive value rate, and a 66% negative predictive value rate. Thermography yielded an 81.6% sensitivity rate, a 57.8% specificity rate, a 78.9% positive predictive value rate, and a 61.9% negative predictive value rate. The results revealed thermography cannot substitute mammography in early diagnosis of breast cancer, however it shows promise as an adjunctive screening and diagnostic tool.

Wishart et al (2010) conducted a study on 100 women comparing differing thermographic analysis tools prior to the participants undergoing biopsy. One hundred and six biopsies were performed on the 100 participants resulting in 65 malignancies and 41 benign lesions. The participants were scanned prior to the biopsy using a digital infrared breast scan (Sentinel BreastScan) and the images were analyzed four ways, blind to biopsy results. The highest accuracy rate of a single method was via expert manual review with a sensitivity of 78%, followed by novel artificial intelligence program NoTouch BreastScan with a 70% sensitivity. Sentinel screening report yielded a low 53% sensitivity rate, and Sentinel artificial intelligence only had a 48% sensitivity. NoTouch BreastScan exhibited a higher sensitivity and specificity of 78% and 75% respectively, in women under 50 years old. The combination of thermography analyzed with NoTouch BreastScan technology paired with a mammogram exhibited an 89% sensitivity, showing that thermography as an adjunct to be an effective screening tool, especially in younger women.

Emerging research reveals advances in infrared technology paired with artificial intelligence computer aided diagnostic algorithms are greatly improving thermography's specificity and diagnostic capabilities, up to 91-99% accuracy, in breast cancer screening and diagnosis. To be recommended for clinical practice more research must be conducted into optimal environmental controls during imaging, standard imaging technology requirements, consistent analysis tools, and studies to validate accurate sensitivity rates (Remini et al. 2021; Khan et al. 2021; Kakileti et al. 2020; Sudhakar et al. 2018)

Breast Specific Gamma Imaging (BSGI).
De Feo et al. (2022) conducted a systematic review that analyzed studies that compared at least one anatomical imaging modality - ultrasound (US), mammography (MMG), and/or MRI - with BSGI. A total of 15 studies met inclusion criteria, all of which were determined to have low risk of bias and applicability concerns. The results were as follows: BSGI had a similar sensitivity and a higher specificity than MRI. BSGI had a higher specificity, positive predictive value, and negative predictive value compared to US and MMG. When utilized in the evaluation for suspected breast lesions, sensitivity was higher with BSGI than without. The authors concluded BSGI is a valuable imaging modality, however the increased radiation burden associated with BSGI must be considered when determining best clinical use.

Zhang et al (2020) conducted a retrospective comparative study on the diagnostic accuracy of MMG and US versus MMG and BSGI. Three hundred and sixty-four women with both mammographically dense breasts and a final surgical/biopsy pathological diagnosis were included in the study. BSGI in conjunction with MMG had a higher specificity rate (Sp-Difference 10.3%, p = 0.003) than MMG and US; however, there was no difference in the enhancement of MMG diagnostic sensitivity between BSGI and US. The area under the ROC curve showed that MMG and BSGI had better diagnostic accuracy than MMG and US (0.90 vs. 0.83, p = 0.0019).

Liu et al (2020) conducted a retrospective review of 390 patients who had undergone diagnosis and treatment at a single breast surgery center. All patients were imaged with BSGI, mammography, ultrasound, and MRI; and the resulting diagnostic accuracy data between the differing imaging techniques was compared. BSGI, MRI, mammography, and ultrasound yielded respective sensitivity values of 91.7, 92.5, 77.3, and 82.1%, while the respective specificity values for these imaging modalities were 80.7, 69.7, 74.5, and 70.8%. For lesions > 1 cm, BSGI offered a sensitivity of 92.5%. For mammographic breast density A, B, C, and D, BSGI offered a sensitivity of 93.3, 94.0, 91.5, and 89.3%, respectively; and yielded a significantly higher lesion-to-normal lesion ratio (LNR) for malignant lesions relative to benign lesions (2.76 ± 1.32 vs 1.46 ± 0.49).

Zhan et al (2020) conducted a retrospective review of 177 women diagnosed with BI-RADS4 category lesions via ultrasound/mammography who then underwent BSGI for confirmation. The specificity and positive predictive values of BSGI were 78.3% (47/60) and 89.5% (111/124) respectively, versus mammography at 48.3% (29/60) and 77.5% (107/138), and ultrasound at 53.3% (32/60) and 79.6% (109/137). The sensitivity and specificity of BSGI for the detection of lesions ≤1 cm in size were 90.9% (10/11) and 88.0% (22/25), respectively, while for breast lesions >1 cm in size these values were 94.3% (100/106) and 71.4% (25/35). In addition, BSGI sensitivity and specificity values for dense breast tissue were 94.0% (79/84) and 78.0% (39/50), respectively, whereas for non-dense breast tissue these values were 97.0% (32/33) and 80.0% (8/10). The sensitivity of BSGI for invasive ductal carcinomas and ductal carcinomas in situ (DCIS) was 98.9% (95/96) and 75.0% (9/12), respectively; and the tumor to normal tissue ratio of BSGI for malignant lesions was significantly higher than for benign lesions (2.18 ± 1.17 vs 1.66 ± 0.40, t = 7.56, P<0.05). The authors concluded that BSGI is a highly sensitive detection tool, especially in invasive ductal carcinoma cases.

National and Specialty Organizations

The following professional organizations have not endorsed or have not mentioned thermography and/or BSGI as standard diagnostic tests for the detection of breast lesions:

- **The American College of Radiology (ACR)** issued a Practice Parameter document in February 2023 on molecular breast imaging. It states the indications, contraindications, dosing, research, and additional information surrounding the imaging technique.
- **The National Comprehensive Cancer Network (NCCN)** (2022) guidelines for Breast Cancer Screening and Diagnosis do not mention thermography nor BSGI in their screening recommendations.

- **The Society of Breast Imaging (SBI)** (2012) does not currently support the use of thermography/infrared imaging of the breast as either a screening tool or as an adjunctive diagnostic tool. The SBI (Lee, 2010) does not endorse routine use of other imaging techniques, including BSGI, outside of mammography, ultrasound, and MRI

CODING & BILLING INFORMATION

CPT (Current Procedural Terminology) Codes

CPT	Description
78800	Radiopharmaceutical localization of tumor, inflammatory process or distribution of radiopharmaceutical agent(s) (includes vascular flow and blood pool imaging, when performed); planar, single area (eg, head, neck, chest, pelvis), single day imaging
78801	Radiopharmaceutical localization of tumor, inflammatory process or distribution of radiopharmaceutical agent(s) (includes vascular flow and blood pool imaging, when performed); planar, 2 or more areas (eg, abdomen and pelvis, head and chest), 1 or more days imaging or single area imaging over 2 or more days (when used for BSGI)
93740	Temperature gradient studies (when used for breast thermography)

HCPCS (Healthcare Common Procedure Coding System) Codes

HCPCS	Description
A9500	Technetium Tc-99m sestamibi, diagnostic, per study dose (when used for BSGI)
S8080	Scintimammography (radioimmunoscintigraphy of the breast, unilateral), including supply of Radiopharmaceutical (when used for BSGI)

CODING DISCLAIMER. Codes listed in this policy are for reference purposes only and may not be all-inclusive. Deleted codes and codes which are not effective at the time the service is rendered may not be eligible for reimbursement. Listing of a service or device code in this policy does not guarantee coverage. Coverage is determined by the benefit document. Molina adheres to Current Procedural Terminology (CPT®), a registered trademark of the American Medical Association (AMA). All CPT codes and descriptions are copyrighted by the AMA; this information is included for informational purposes only. Providers and facilities are expected to utilize industry standard coding practices for all submissions. When improper billing and coding is not followed, Molina has the right to reject/deny the claim and recover claim payment(s). Due to changing industry practices, Molina reserves the right to revise this policy as needed.

APPROVAL HISTORY

08/09/2023	Policy reviewed, no changes to criteria. IRO reviewed July 2023.
08/10/2022	Policy reviewed, no changes to criteria.
08/11/2021	Policy reviewed, no changes to criteria.
06/17/2020	Policy reviewed, no changes to criteria.
06/19/2019	Policy reviewed, no changes to criteria.
03/08/2018	Policy reviewed, no changes to criteria.
01/01/2016	Policy reviewed, revised to include breast-specific gamma imaging (BSGI) – another test used for breast cancer screening.
12/16/2015	Policy reviewed, no changes.
12/11/2013	New policy.

REFERENCES

1. American Cancer Society (ACS). Newer and experimental breast imaging tests. Updated January 14, 2022. Accessed July 2023. https://www.cancer.org/cancer/types/breast-cancer/screening-tests-and-early-detection/experimental-breast-imaging.html.
2. American College of Radiology (ACR). Practice parameter for the performance of Molecular Breast Imaging (MBI) using a dedicated gamma camera. Adopted 2017. Revised 2022. Accessed July 2023. https://www.acr.org/-/media/ACR/Files/Practice-Parameters/MBI.pdf.
3. Centers for Medicare and Medicaid Services (CMS). Medicare coverage database: National Coverage Determination (NCD) – Thermography (220.11). Published December 21, 1992. Accessed July 2023. https://www.cms.gov/medicare-coverage-database/search.aspx.
4. De Feo MS, Sidrak MMA, Conte M, et al. Breast-Specific Gamma Imaging: An Added Value in the Diagnosis of Breast Cancer, a Systematic Review. Cancers (Basel). 2022 Sep 23;14(19):4619. doi: 10.3390/cancers14194619.
5. Kakileti ST, Madhu HJ, Krishnan L, et al. Observational Study to Evaluate the Clinical Efficacy of Thermalytix for Detecting Breast Cancer in Symptomatic and Asymptomatic Women. JCO Glob Oncol. 2020 Oct;6:1472-1480. Doi: 10.1200/GO.20.00168.

6. Khan AA, Arora AS. Thermography as an Economical Alternative Modality to Mammography for Early Detection of Breast Cancer. J Healthc Eng. 2021 Jul 31;2021:5543101. doi: 10.1155/2021/5543101.
7. Lee CH, Dershaw DD, Kopans D, et al. Breast Cancer Screening With Imaging: Recommendations From the Society of Breast Imaging and the ACR on the Use of Mammography, Breast MRI, Breast Ultrasound, and Other Technologies for the Detection of Clinically Occult Breast Cancer. Journal of the American College of Radiology. 2010;7(1):18-27. https://doi.org/10.1016/j.jacr.2009.09.022
8. Liu H, Zhan H, Sun D, Zhang Y. Comparison of BSGI, MRI, mammography, and ultrasound for the diagnosis of breast lesions and their correlations with specific molecular subtypes in Chinese women. BMC Med Imaging. 2020 Aug 15;20(1):98. doi: 10.1186/s12880-020-00497-w.
9. Morais KC, Vargas JC, Reisemberger GG, et al. An infrared image-based methodology for breast lesions screening. Infrared Physics & Technology, 2016;76:710-721. doi.org/10.1016/j.infrared.2016.04.036.
10. National Comprehensive Cancer Network (NCCN). NCCN Guidelines: Breast Cancer (V.4.2023). Updated March 23, 2023. Accessed June 2023. https://www.nccn.org/guidelines/category_1.
11. Neal CH, Flynt KA, et al. Breast imaging outcomes following abnormal thermography. Acad Radiol. 2018 Mar;25(3):273-278. doi: 10.1016/j.acra.2017.10.015. Accessed July 2023.
12. Omranipour R, Kazemian A, et al. Comparison of the accuracy of thermography and mammography in the detection of breast cancer. Breast Care (Basel). 2016 Aug;11(4):260-264. doi: 10.1159/000448347. Accessed July 2023.
13. Prasad SS, Ramachandra L, et al. Evaluation of efficacy of thermographic breast imaging in breast cancer: A pilot study. Breast Dis. 2016;36(4):143-147. doi: 10.3233/BD-160236.
14. Rakhunde MB, Gotarkar S, Choudhari SG. Thermography as a Breast Cancer Screening Technique: A Review Article. Cureus. 2022 Nov 8;14(11):e31251. doi: 10.7759/cureus.31251.
15. Resmini R, Faria da Silva L, Medeiros PRT, et al. A hybrid methodology for breast screening and cancer diagnosis using thermography. Comput Biol Med. 2021 Aug;135:104553. doi: 10.1016/j.compbiomed.2021.104553.
16. Society of Breast Imaging. Position statement: Breast thermography. Published 2012. Accessed July 2023. https://www.sbi-online.org/sbi-recommendations-position-statements.
17. Sudhaka S, Manjunath G, Kakileti, ST, Madhu H. Thermalytix: an advanced artificial intelligence-based solution for non-contact breast screening. International Journal of Medical and Health Sciences, 2018;12(2): 48-51.
18. United States Food and Drug Administration (FDA). 510K premarket notification database. FDAhttps://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm.
19. United States Food and Drug Administration (FDA) Center for Devices and Radiological Health. 510(k) premarket notification (search product code “IYM” [telethermographic system], “LHQ” (telethermographic system for adjunctive use). Accessed July 2023. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm.
20. United States Food and Drug Administration (FDA). Consumer Update: Breast Cancer Screening: Thermogram No Substitute for Mammogram. Published January 13, 2021. Accessed July 2023. https://www.fda.gov/consumers/consumer-updates/breast-cancer-screening-thermogram-no-substitute-mammogram.
21. United States Food and Drug Administration (FDA). Drugs@FDA: FDA-Approved Drugs. https://www.fda.gov/drugs.
22. United States Preventive Services Task Force (USPSTF). Breast cancer: Screening (update in progress). Published 2016. Updated April 29, 2021. Accessed July 2023. https://www.uspreventiveservicestaskforce.org/.
23. Wishart GC, Campisi M, Boswell et al. The Accuracy of Digital Infrared Imaging for Breast Cancer Detection in Women Undergoing Breast Biopsy. European Journal of Surgical Oncology, 2010, 36 (6), pp.535. doi.org/10.1016/j.ejso.2010.04.003f
24. Zhan H, Liu H, Sun D. Comparison of 99mTc-MIBI scintigraphy, ultrasound, and mammography for the diagnosis of BI-RADS 4 category lesions. BMC Cancer. 2020 May 24;20(1):463. doi: 10.1186/s12885-020-06938-7.
25. Zhang XH, Xiao C, et al. Diagnostic value of nineteen different imaging methods for patients with breast cancer: A network meta-analysis. Cell Physiol Biochem. 2018;46(5):2041-2055. doi: 10.1159/000489443.
26. Zhang Z, Wang W, Wang X, et al. Breast-specific gamma imaging or ultrasonography as adjunct imaging diagnostics in women with mammographically dense breasts. Eur Radiol. 2020 Nov;30(11):6062-6071. doi: 10.1007/s00330-020-06950-2.