

新たな装置によりマンモグラフィーの不快感が緩和する可能性がある(Abstract SSA20-05)

研究者らは女性にとってマンモグラフィーをより快適にする可能性のある新たな装置を開発した

Researchers have developed a new device that may result in more comfortable mammography for women

マンモグラフィーにおいて適用する圧を標準化することにより、画像の質を損なうことなく乳房圧迫に関連した疼痛が軽減する、とのスタディ結果がRadiological Society of North America年次集会以て発表された。力を調整することにより乳房に与えられる圧の量には3キロボパスカル (kPa) から30kPa超の範囲にわたる実質的な違いが生じ得た。研究者らは、力ではなく圧に基づいた圧迫プロトコルは、力を基盤にした現在の圧迫プロトコルによる疼痛および変動性を軽減するとの仮説を立てている。さらに、圧迫中の平均の圧を表示するデバイスを開発し、スクリーニングマンモグラフィーを予定している無症状の女性433人における二重盲検ランダム化コントロールトライアルにおいてその効果を調査した。各参加者に与えられる圧迫4回中3回が指標とする力を14 デカニュートン (daN) に標準化された。ランダムに割り当てられた1回の圧迫は10kPaの圧を指標に標準化された。参加者は痛みを数による評尺度で点数化し、3人の熟練した乳房スクリーニング放射線科医らが再撮影の必要な画像を指摘した。10kPaの圧で撮影を行っても放射線用量や画像の質の面で妥協する必要はなく、平均して14daNよりも痛みが少なくと報告された。

Full Text

Researchers have developed a new device that may result in more comfortable mammography for women. According to a study presented at the annual meeting of the Radiological Society of North America (RSNA), standardizing the pressure applied in mammography would reduce pain associated with breast compression without sacrificing image quality.

Compression of the breast is necessary in mammography to optimize image quality and minimize absorbed radiation dose. However, mechanical compression of the breast in mammography often causes discomfort and pain and deters some women from mammography screening.

An additional problem associated with compression is the variation that occurs when the technologist adjusts compression force to breast size, composition, skin tautness and pain tolerance. Over-compression, or unnecessarily high pressures during compression, is common in certain European countries, especially for women with small breasts. Over-compression occurs less frequently in the United States, where under-compression, or extremely low applied pressure, is more common.

"This means that the breast may be almost not compressed at all, which increases the risks of image quality degradation and extra radiation dose," said Woutjan Branderhorst, Ph.D., researcher in the Department of Biomedical Engineering and Physics at the Academic Medical Center in Amsterdam.

Overall, adjustments in force can lead to substantial variation in the amount of pressure applied to the breast, ranging from less than 3 kilopascals (kPa) to greater than 30 kPa.

Dr. Branderhorst and colleagues theorized that a compression protocol based on pressure rather than force would reduce the pain and variability associated with the current force-based compression protocol. Force is the total impact of one object on another, whereas pressure is the ratio of force to the area over which it is applied.

The researchers developed a device that displays the average pressure during compression and studied its effects in a double-blinded, randomized control trial on 433 asymptomatic women scheduled for screening mammography.

Three of the four compressions for each participant were standardized to a target force of 14 dekanewtons (daN). One randomly assigned compression was standardized to a target pressure of 10 kPa.

Participants scored pain on a numerical rating scale, and three experienced breast screening radiologists indicated which images required a retake. The 10 kPa pressure did not compromise radiation dose or image quality, and, on average, the women reported it to be less painful than the 14 daN force.

The study's implications are potentially significant, Dr. Branderhorst said. There are an estimated 39 million mammography exams performed every year in the U.S. alone, which translates into more than 156 million compressions. Pressure standardization could help avoid a large amount of unnecessary pain and optimize radiation dose without adversely affecting image quality or the proportion of required retakes.

"Standardizing the applied pressure would reduce both over- and under-compression and lead to a more reproducible imaging procedure with less pain," Dr. Branderhorst said.

The device that displays average pressure is easily added to existing mammography systems, according to Dr. Branderhorst.

"Essentially, what is needed is the measurement of the contact area with the breast, which then is combined with the measured applied force to determine the average pressure in the breast," he said. "A relatively small upgrade of the compression paddle is sufficient."

Further research will be needed to determine if the 10 kPa pressure is the optimal target.

The researchers are also working on new methods to help mammography technologists improve compression through better positioning of the breast.

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RSNA2014 特集

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3Dマンモグラフィーは高濃度乳腺におけるがん検出率を向上させる

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