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# The effect of immediate breast reconstruction with Becker-25 prosthesis on the preservation of proper body posture in patients after mastectomy

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**Abstract**

*Purpose*: This was a prospective study comparing coronal, sagittal and transverse plane body posture parameters in women after radical mastectomy and women after radical mastectomy with immediate breast reconstruction (IBR) for stage I and II breast cancer.
*Methods*: The three studied groups were one that underwent Madden's radical mastectomy ($n = 38$), a second with skin sparing mastectomy with IBR with expander-prosthesis Becker-25 ($n = 38$), and the control ($n = 38$). All the women were examined to determine their body posture in the coronal, sagittal and transverse planes using three-dimensional (3D) body surface analysis before and 6, 12, 18 and 24 months after surgery.
*Results*: There is a significant difference body posture in the coronal, sagittal and transverse planes between groups of patients after mastectomy with IBR comparing with patients after mastectomy alone. The women after radical mastectomy demonstrated the greatest postural changes in particular parameters of body posture in postsurgical months 18 and 24. The IBR group only demonstrated significant postural changes in one parameter, though as time after surgery increased, these changes decreased.
*Conclusions*: IBR after mastectomy has an impact on proper body posture. Photogrammetric examination revealed important body posture disturbances only in the radical mastectomy group. It gives useful information on body posture parameters in the evaluation of quality of life in breast cancer survivors. It appears that immediate breast reconstruction helps to preserve proper body posture after mastectomy.


*Keywords:* Body posture; Immediate breast reconstruction; Mastectomy; Moire conturography

## Introduction

Breast cancer remains the most frequent malignant neoplasm in women. Surgical options include radical mastectomy (RM), breast conservative treatment (BCT), and immediate breast reconstruction (IBR). Treatment of breast malignancies is currently centered on minimalizing surgical intervention while still eradicating the neoplasm. Despite an increasing proportion of indications for surgical intervention with breast conservation in early breast cancer stages, as many as 10% of stage I and 30% of stage II patients do not qualify for BCT.[1] In addition to difficulties in offering each patient a 5-week course of radiotherapy, the number of unwilling patients and difficulties in staging the disease before surgery, there are many women who still undergo RM in early stages of the disease.[2,3] In these patients, a good solution to minimalize scarring is IBR.[4] To date, the value of IBR has been mainly in the return or improvement of quality of life and maintenance of a natural appearance, both factors leading to better self-esteem and emotional well-being in this group of women.[5–7]

There have been almost no attempts to determine the effect of mastectomy and breast reconstruction on the maintenance of proper body posture after surgery. A large number of women after mastectomy complain of increased back pain a few months to years after mastectomy.[8,9] The studies by Rostkowska et al. have shown a statistically significant disturbance of proper body posture in women after mastectomy.[10] These disturbances have even been

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demonstrated in women who underwent intensive rehabilitation. It has also been noted that these disturbances in body posture are decreased in women who used an external prosthesis not only during the day but also at night, while sleeping.[11] This leads to the assumption that IBR may have a positive effect in maintenance of proper body posture in women after mastectomy.

The purpose of this study was to compare the changes in body posture of women after RM and women who underwent IBR with expander-prosthesis Becker-25.

## Patients and methods

Prospective studies were performed in a group of women with stage I and II breast cancer,operated in 2000–2005 at the General Surgery Department of the State Regional Hospital in Leszno, Poland.

Group A ($n = 38$) underwent RM using Madden's method. Group B ($n = 38$) underwent skin sparing mastectomy (SSM) with single-stage IBR using a subpectorally placed expander-prosthesis Becker-25. The control group, group C ($n = 38$), were healthy women who have not had surgery. Groups A and B were comparable in terms of age, body mass, height, the degree of cancer advancement, and comorbidities (Table 1). The study continued until all dimensional parameters had been obtained for each group's 38 women.

All the women were examined to determine their body posture using three-dimensional (3D) analysis of the body surface with photogrammetry. This method involves objective anthropometric measurements based on computer analysis of the 3D image constructed of the spine of each examined woman. The theoretical basis of the measurements is Moire conturography, described in optics. A ray of while light hitting an uneven surface leads to this light reflecting at various degrees. The reflected image was registered by a camera and digitally configured and saved by a special computer program. This system allowed for real-time registration and comparison of the resultant changes in the body posture of the examined women (Photograph 1).

This non-invasive and non-burdening manner of obtaining measurements allowed for multiple measurements in each woman postoperatively. Before taking a measurement, characteristic bony structures were marked on the patient's back: the C7 to S1 spinous processes, the lower borders of the scapulae, and the superior posterior iliac spines. The static measurements were taken in specific, reproducible conditions, accounting for the same parameters of the visual apparatus, at a constant distance of 3.2 m between the camera and the patient, who was standing in a relaxed position. This examination allowed for the measurement of 54 parameters in the coronal, sagittal, and transverse planes, which made it possible to objectively evaluate the body posture of the patients.

For the purposes of this study, only a few parameters that best demonstrated differences in the coronal, sagittal and transverse planes were used, and were selected before the first examination:

- MDL – the maximal deviation of the line of the superior posterior iliac spines from C7-S1,
- DHSh – the difference in the height of the shoulders,
- DHS – the difference in the height of the lower border of the scapulae (angling of the body),
- API – the angle of pelvic inclination,
- APR – the angle of pelvic rotation in the sagittal plane, and
- RS – the difference in the depth of the lower border of the scapulae (rotation).

Five measurements were taken for each patient: before the surgery (after final diagnosis and determining the best method of treatment), and 6, 12, 18, and 24 months after surgery.

## Statistical analysis

To compare the measurable parameters at each interval that met the initial criteria for one-way ANOVA were analyzed with the post hoc Newman–Keuls test with the assumption of Gaussian distribution and homogeneity of

Table 1
Characteristics of women in groups A, B, and C, who underwent photogrammetric examination.

| | IBR $n = 38$ | RM $n = 38$ | Control $n = 38$ | $p$-value |
|---|---|---|---|---|
| Age (years) | 48.5 ± 10.99 (29–65) | 51.3 ± 9.2 (36–68) | 49.8 ± 11.1 (34–66) | $p = 0.66$ (ANOVA) |
| Height (cm) | 163 ± 14.8 (146–176) | 160.7 ± 9.8 (152–169) | 158.9 ± 8.9 (145–168) | $p = 0.8$ (ANOVA) |
| Weight (kg) | 61.3 ± 12.4 (48–79) | 64.1 ± 11.7 (50–82) | 62.4 ± 10.2 (51–77) | $p = 0.57$ (ANOVA) |
| Mass of resected breast tissue (g) | 455 ± 156 | 512 ± 182 | | $p = 0.09$ ($t$-Student) |
| Hormonal status | | | | |
| Menstruating | 17 | 16 | 19 | $p = 0.9$ (Fisher–Freeman–Halton) |
| Menopausal | 21 | 22 | 19 | |
| Additional treatment | | | | |
| Chemotherapy | 26 | 28 | | $p = 0.8$ (Fisher) |
| Hormone therapy | 33 | 31 | | $p = 0.75$ (Fisher) |
| Radiotherapy | 0 | 0 | | |