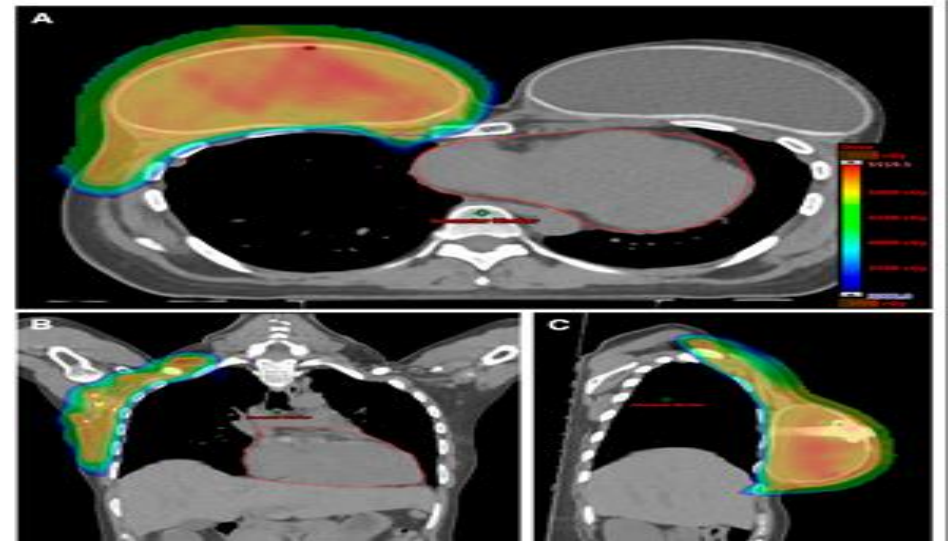
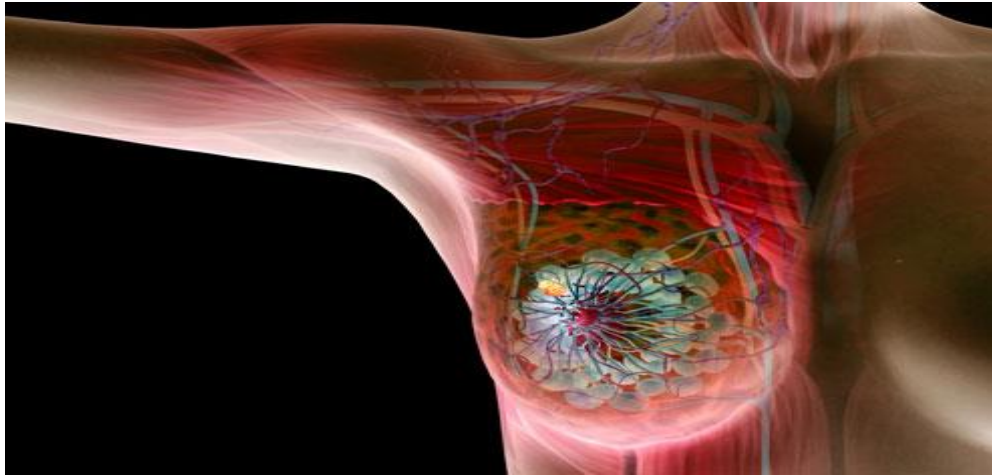




Radioterapia a zabiegi rekonstrukcyjne piersi

ELŻBIETA NOWICKA – SPECJALISTA RADIOTERAPII ONKOLOGICZNEJ
III KLINIKA RADIOTERAPII I CHEMIOTERAPII



CENTRUM ONKOLOGII – INSTYTUT
IM. MARII SKŁODOWSKIEJ-CURIE
ODDZIAŁ W GLIWICACH

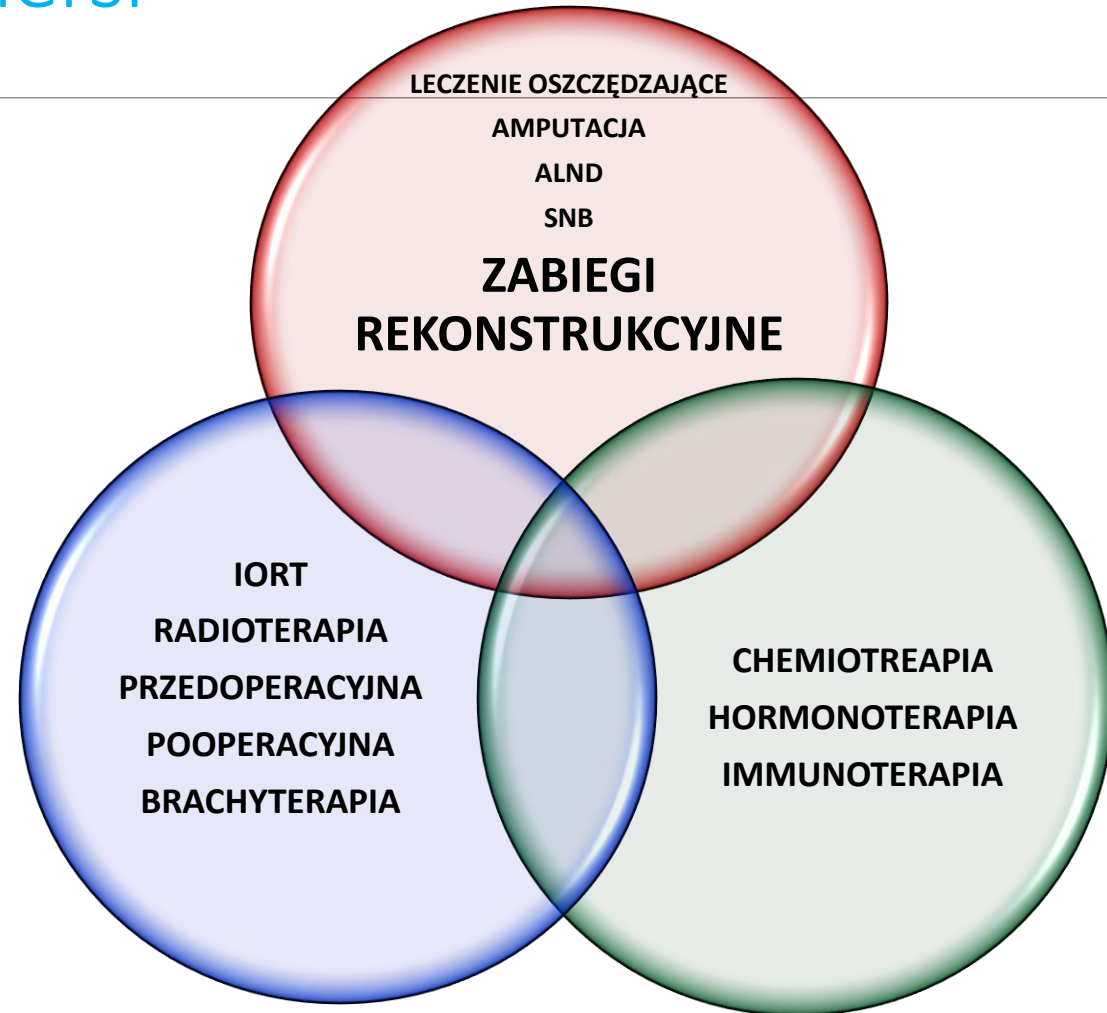
Zabiegi rekonstrukcyjne piersi w skojarzonym leczeniu raka piersi

Wg zaleceń EUSOMA:

....rozważenie zabiegów rekonstrukcyjnych u kobiet wymagających mastektomii.....

....zabiegi jednoczesowe lub odroczone.....

....breast reconstruction as challenge to PMRT delivery.....





Amputacja



BCT



SSM

Rekonstrukcje piersi jako element skojarzonego leczenia raka piersi

Gland Surgery, Vol 5, No 4 August 2016

417

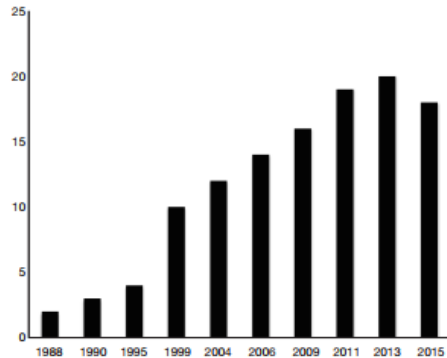


Figure 1 Number of faculties in the Department of Plastic Surgery at the MD Anderson Cancer Center (MDACC).

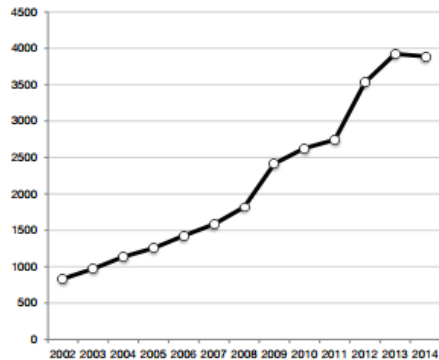


Figure 2 Total number of breast reconstructive cases.

Delayed versus immediate reconstruction

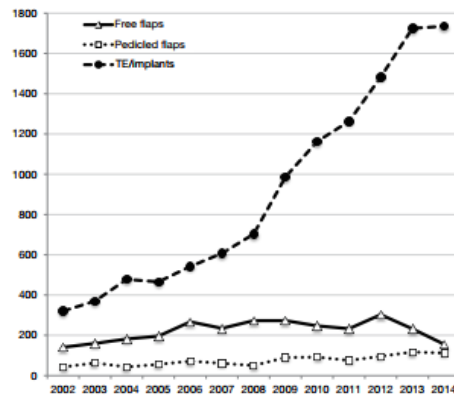


Figure 3 Types of breast reconstruction.

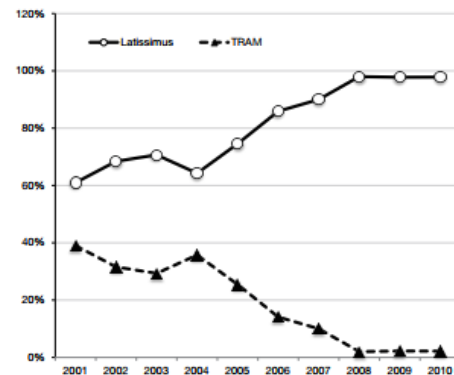


Figure 4 Types of pedicled flaps for breast reconstruction.

National Breast Reconstruction Utilization in the Setting of Postmastectomy Radiotherapy

-Irradiated patients were 30% less likely to receive IBR (immediate breast reconstruction)

- National Cancer Database (NCDB). The study hypothesis is that prosthetic techniques have become the most common method of IBR in the setting of PMRT- 2004 to 2013

-Rates of reconstruction increased more so in radiated compared with nonradiated patients for both implants (IRR 1.15 vs. 1.11) and autologous techniques (IRR 1.08 vs. 1.06).

-Autologous reconstructions were more common in those receiving PMRT until 2005 ($p < 0.05$), with no predominant technique thereafter.

J Reconstr Microsurg.2017 Jun;33(5):312-317.

Radioterapia po mastektomii - PMRT



- Blizna po amputacji i okolica nadobojczykowa – najczęstsze miejsca nawrotów po mastektomii
- 50% nawrotów w bliźnie, 33% w okolicy nad/podobojcza
- Izolowane wznowy w okolicy pachy po adekwatnej chirurgii - do 3%
- LC zależna od cechy T i N
- Złe wyniki leczenia nawrotów miejscowych

PMRT

EBCTCG LANCET. 2014 MAR 19.

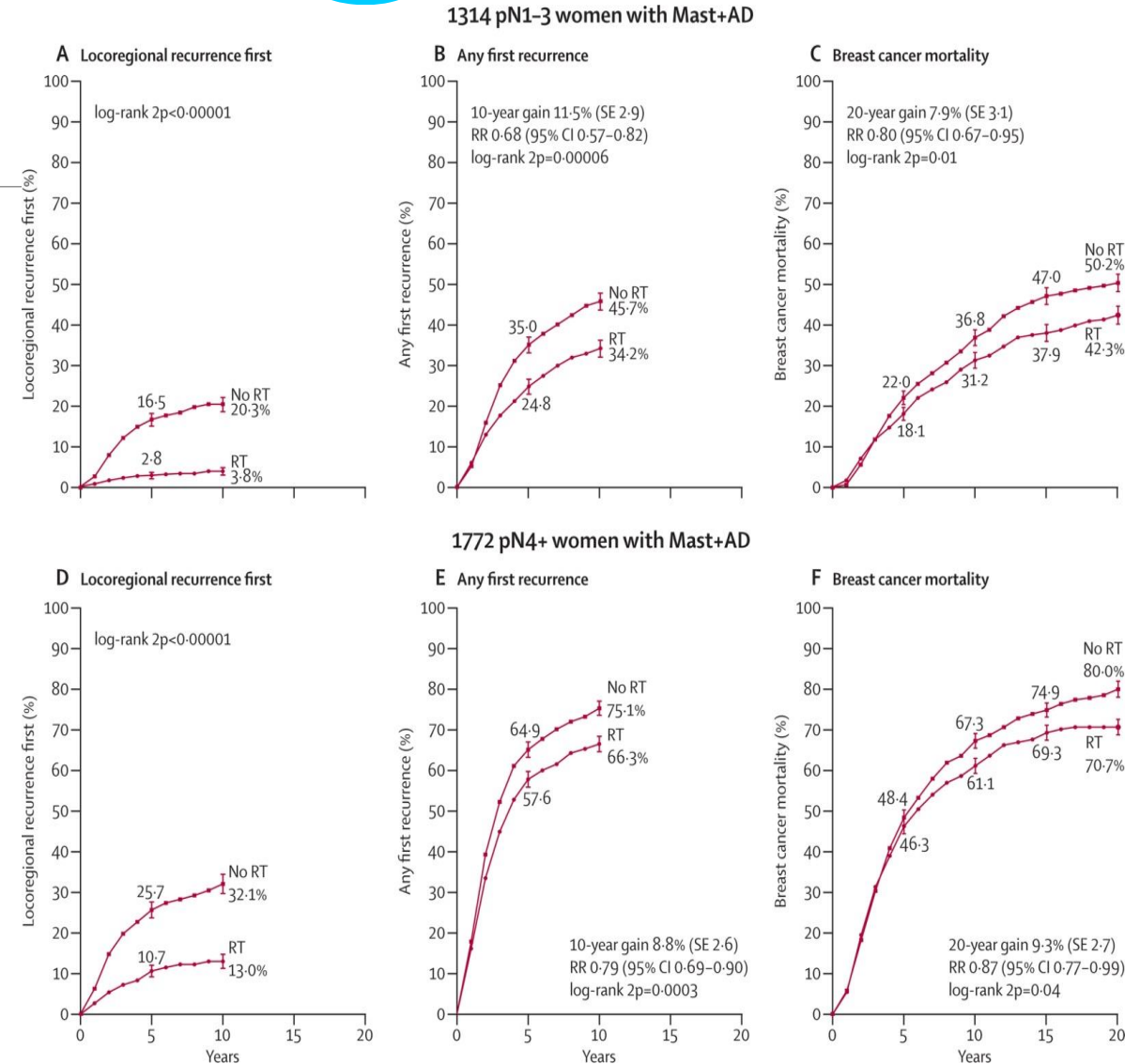
RAGAZ. J NATL CANCER INST. 2005 JAN 19;97(2):116-26

DANISH BREAST CANCER COOPERATIVE GROUP 82B TRIAL. N ENGL J MED 337:949-955, 1997

☐ - redukcja wznowy miejscowej i lokoregionalnej

☐ - wpływ na OS

☐ - efekt niezależny od leczenia systemowego



Ryzyko LR po mastektomii

Katego ria ryzyka	Niska	Pośred nia	Wysoka
Ryzyko	<10%	10-20%	>20%
T	T1-2	T1-2	T3-4
N(+)	0	1-3	>3
G	1-2	3	
VI	(-)	(+)	
H-P	Ductal	Lobular	

-Pośrednie i wysokie ryzyko wznowy miejscowej

Zmieniające się zasady:

- nowe możliwości leczenia węzłów chłonnych:

SLN dla cN0- wyniki badania [ACOSOG Z 0011](#)

TAD (TARGETED AXILLARY DISSECTION): SLN biopsy and targeted axillary dissection dla cN+

RNI: Regional Nodal Irradiation: Zyk z radioterapii regionalnych węzłów-

- ▶LR-DFS: HR=.59, p=.02,
- ▶MFS: HR=.64, p=.002
- ▶DFS: HR=.68, p=.003
- ▶OS: HR=.76, p=.07

NCIC- MA .20, JCO 2011 29:80s Whelan TJ

Wskazania do radioterapii pooperacyjnej po mastektomii u chorych na raka piersi po neoadjuwantowej chemioterapii:

Should Response to Preoperative Chemotherapy Affect Radiotherapy Recommendations After Mastectomy for Stage II Breast Cancer?

Jennifer R. Bellon, JCO Nov 10, 2012:3916-3920



CentrumChoróbPiersi
BREAST UNIT GLIWICE

Stopień zaawansowania w chwili rozpoznania	Stopień zaawansowania w badaniu H-P	Zalecenie
III lub LABC	każdy	PMRT
Stopień I lub II	Reszkowe zmiany węzłowe	PMRT
	Reszkowe zmiany w piersi ale nie w węzłach	Decyzja uzależniona od dodatkowych czynników: wiek, rozległość resztkowych zmian, stopień odpowiedzi na leczenie, Rozważyć PMRT u chorych - młodych ≤ 40 rz, - z obecnością LVI, - z ujemnym statusem - receptorowym, - bliskim/pozytywnym marginesem chirurgiczny, - rozległym resztkowym naciekiem raka inwazyjnego
	Całkowita odpowiedź w piersi i węzłach chłonnych	Bez wskazań do PMRT

PMRT a zabiegi rekonstrukcyjne piersi

- biologia guza
- plany leczenia systemowego: przed zabiegiem operacyjnym, chemioterapia uzupełniająca, hormonoterapia, immunoterapia
- aktualne zaawansowanie choroby
- wybór pacjenta
- wczesne i odległe konsekwencje

Podejście wielodyscyplinarne: chirurg onkolog, chirurg plastyczny, onkolog kliniczny, radioterapeuta

P/wskazania : **NAWYKI:**

- palenie tytoniu
- nadwaga (BMI)



PMRT a zabiegi rekonstrukcyjne

Decyzja:

- Kto???
- Kiedy??
- Jak???

- Immediate Breast Reconstruction: *Immediate reconstruction as challenge to PMRT delivery*

IBR a wskazania do PMRT : jako ze PMRT może zwiększyć ryzyko powikłań i pogarszać efekt kosmetyczny

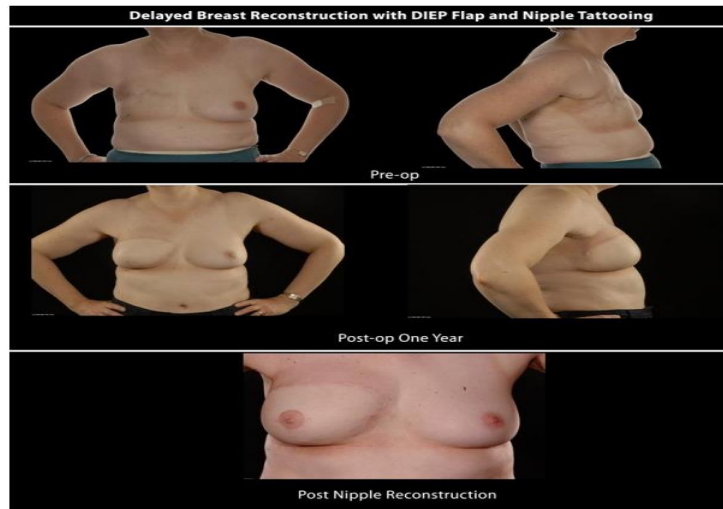
- Konieczność wielodyscyplinarnej decyzji

- Ocena indywidualnego ryzyka nawrotu i toksyczności



Autologiczne

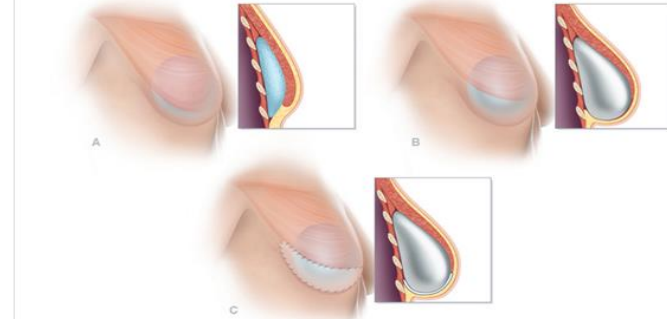
Jednoczasowe



Odroczone

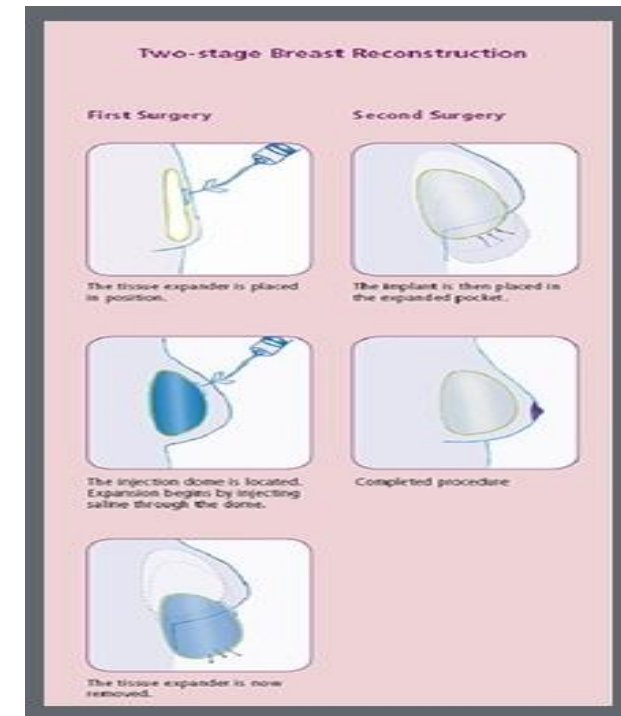
DIRECT-TO-IMPLANT SURGERY

CLICK TO ENLARGE FOR DETAILS



Jednoczasowe

Allogeniczne



Delayed –immediate reconstruction



Dr Steve Kronowitz 2004

- pierwotna idea rekonstrukcji piersi u chorych u których przed zabiegiem niepewne są wskazania do radioterapii
- ekspander umieszczony w trakcie amputacji z maksymalnie bezpiecznym wypełnieniem NaCl
- jeśli są wskazania do PMRT to zmniejsza się wypełnienie i przeprowadza PMRT
- po PMRT ponownie wypełnienie ekspandra i zabieg rekonstrukcyjny

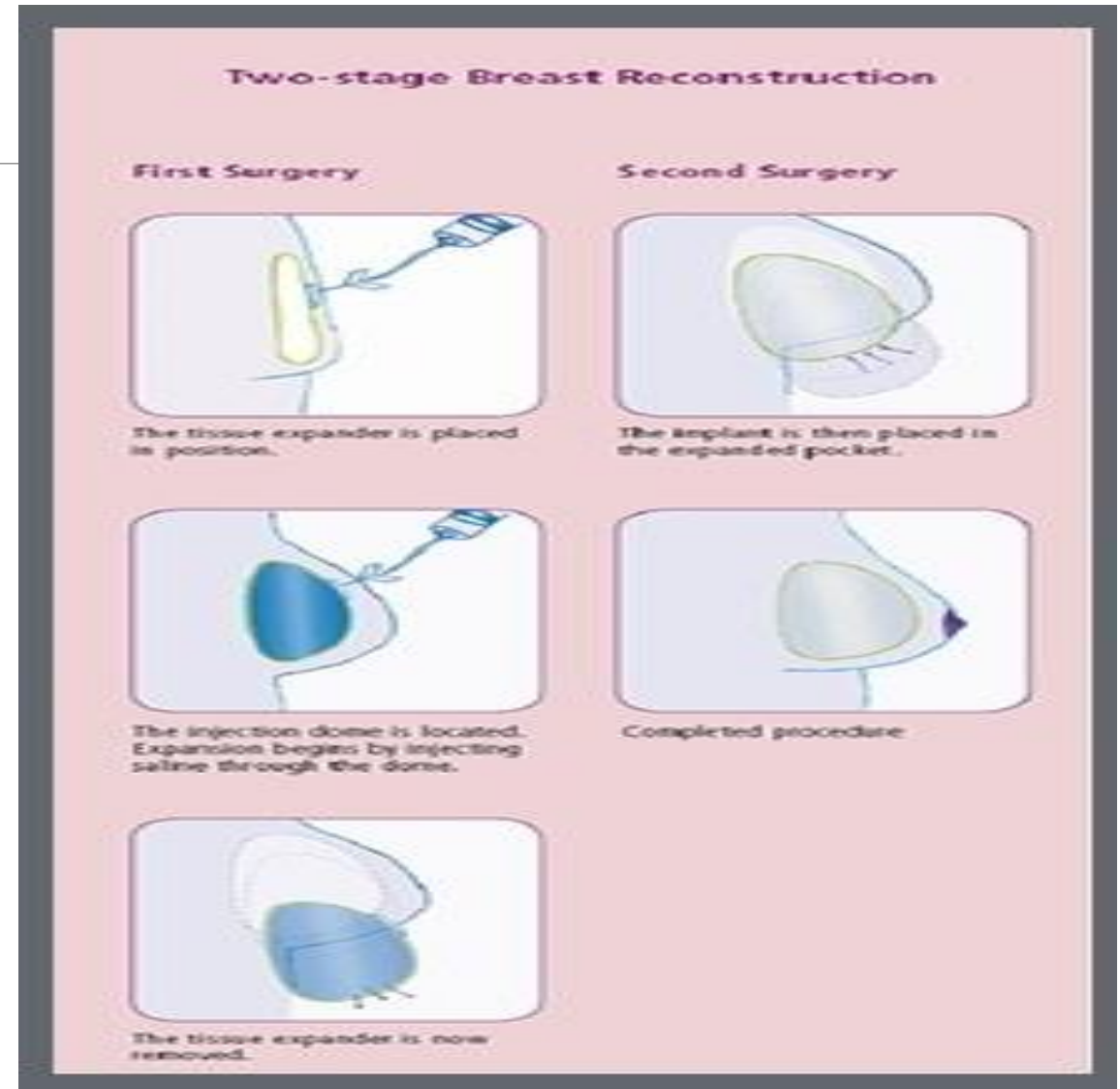


TABLE 1**Advantages and disadvantages of reconstruction techniques***

Technique	Advantages	Disadvantages
Implant-based reconstruction		
Implant reconstruction	– Unilateral/bilateral surgery – No additional scars – No lift defects	– Adjustments often necessary long-term – Radiotherapy results in 40 to 50% capsular contractures – Prosthesis-related complications (contracture, rupture, animation deformity)
Implant ± mesh/ADM ± autodermal graft	– Reduced muscle defects – Improved aesthetic outcome, particularly natural shape – Prosthesis reconstruction possible even with unfavorable skin status	(Except with autodermal graft) Meshes/ADM – Acute local reactions – Inflammation – Expensive
LADO ± implant	– Natural aesthetic outcome, particularly with NSM/SSM and "small" breast – Better long-term outcomes – Suitable for reconstruction of irradiated tissue – Improved implant coverage	– More expensive surgery – Additional scars – Arm/shoulder complaints (tennis, golf, swimming, etc.) – Muscle contracture
Tissue transfer from abdominal wall		
– Pedicle TRAM	– Autologous tissue – No implant needed – Natural appearance – Natural aging process	– Weakening of abdominal wall – Hernias – Adipose tissue necrosis
– Free TRAM	– As for pedicle TRAM, plus: – Less adipose tissue necrosis if blood circulation good	– As for pedicle TRAM, plus: – Time-intensive and staff-intensive microsurgical techniques – Expensive postoperative monitoring – Higher rate of repeat surgery, total necrosis, liponecrosis
– DIEP	– As for pedicle TRAM, plus: – Abdominal musculature preserved – Fewer hernias than with pedicle TRAM – Less pain – Swifter recovery	– As for free TRAM
Tissue transfer from other regions		
Flaps from buttocks (SGAP, IGAP, FCI)	– As for TRAM – No damage to abdominal wall	– As for TRAM – Impaired function of erogenous zones – Not possible bilaterally in single operation
Gracilis flaps from thigh	– As for TRAM – Bilateral surgery possible	– As for free TRAM – Impaired function of erogenous zones

ADM, acellular dermal matrix; DIEP, deep inferior epigastric perforator; FCI, fasciocutaneous infragluteal flap; IGAP, inferior gluteal artery perforator; LADO, latissimus dorsi flap; TRAM, transverse rectus abdominis muscle flap; NSM/SSM, nipple-sparing/skin-sparing mastectomy; SIEA, superficial inferior epigastric artery; SGOP, superior gluteal artery perforator
 *Modified according to (e5)

PMRT a zabiegi rekonstrukcyjne:

-Autologiczne – z tkanek własnych:

Zalety:

- tkanki własne,
- lepszona ocena samopoczucia,
- lepszy efekt kosmetyczny w czasie,

ale

- długi czas zabiegu (ryzyko powikłań operacyjnych)
- ryzyko marwicy- „utrata” przeszczepu,
- drugi obszar chirurgiczny,
- dłuższy czas rekonwalescencji

-Allogeniczne z użyciem protezy:

Zalety:

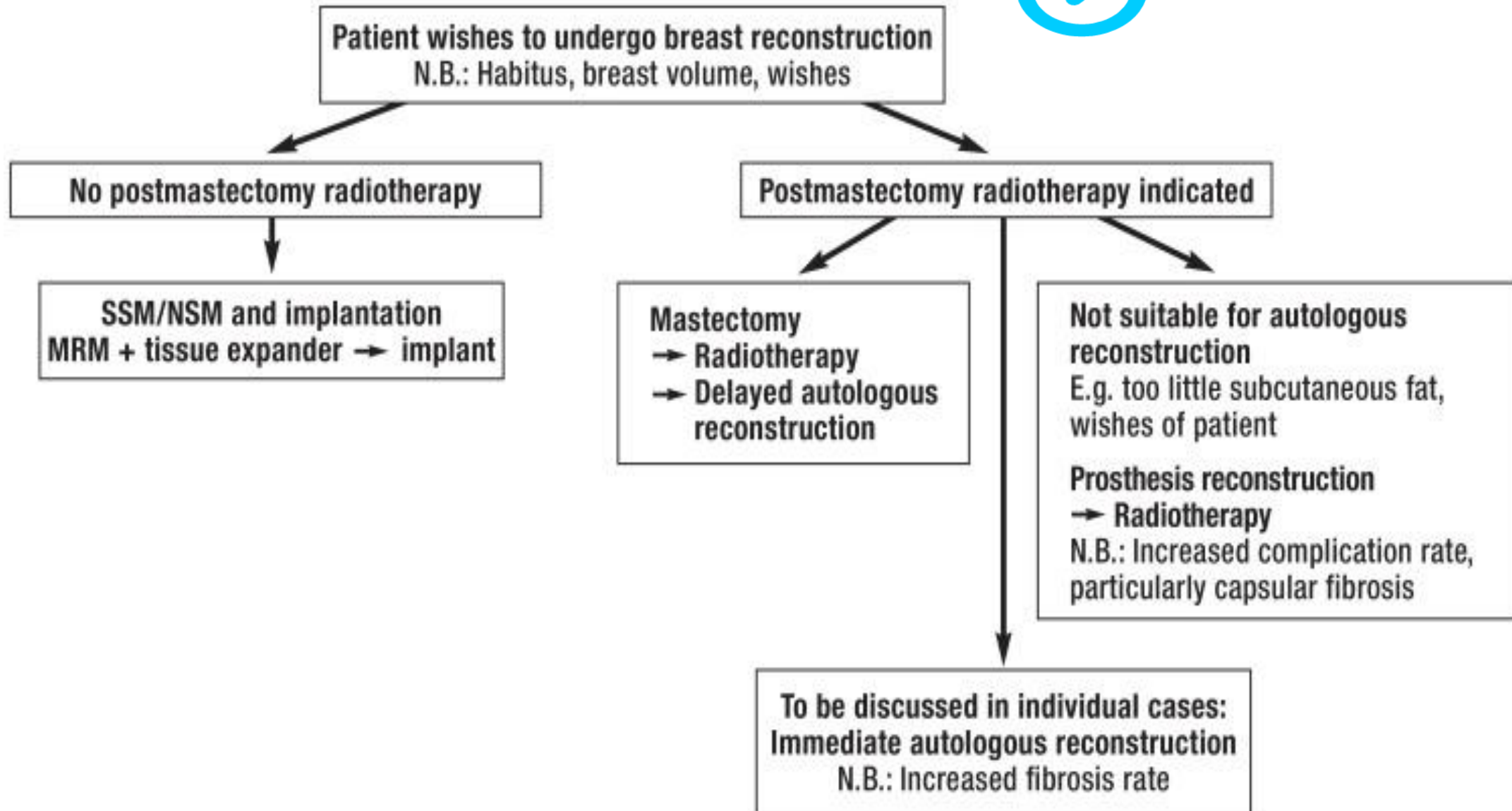
- krótszy czas zabiegu,
- mniejsze ryzyko powikłań śródoperacyjnych i okołooperacyjnych

ale

- materiał „obcy”- ryzyko infekcji, pęknięcia protezy,
- indukcja odpowiedzi immunologicznej na ciała obce,
- ryzyko zwłóknienia torebki protezy i konieczność wymiany (średni czas „życia „ impantu ok. 10 lat),
- gorszy efekt funkcjonalny



Unilateral two-stage reconstruction after nipple sparing mastectomy



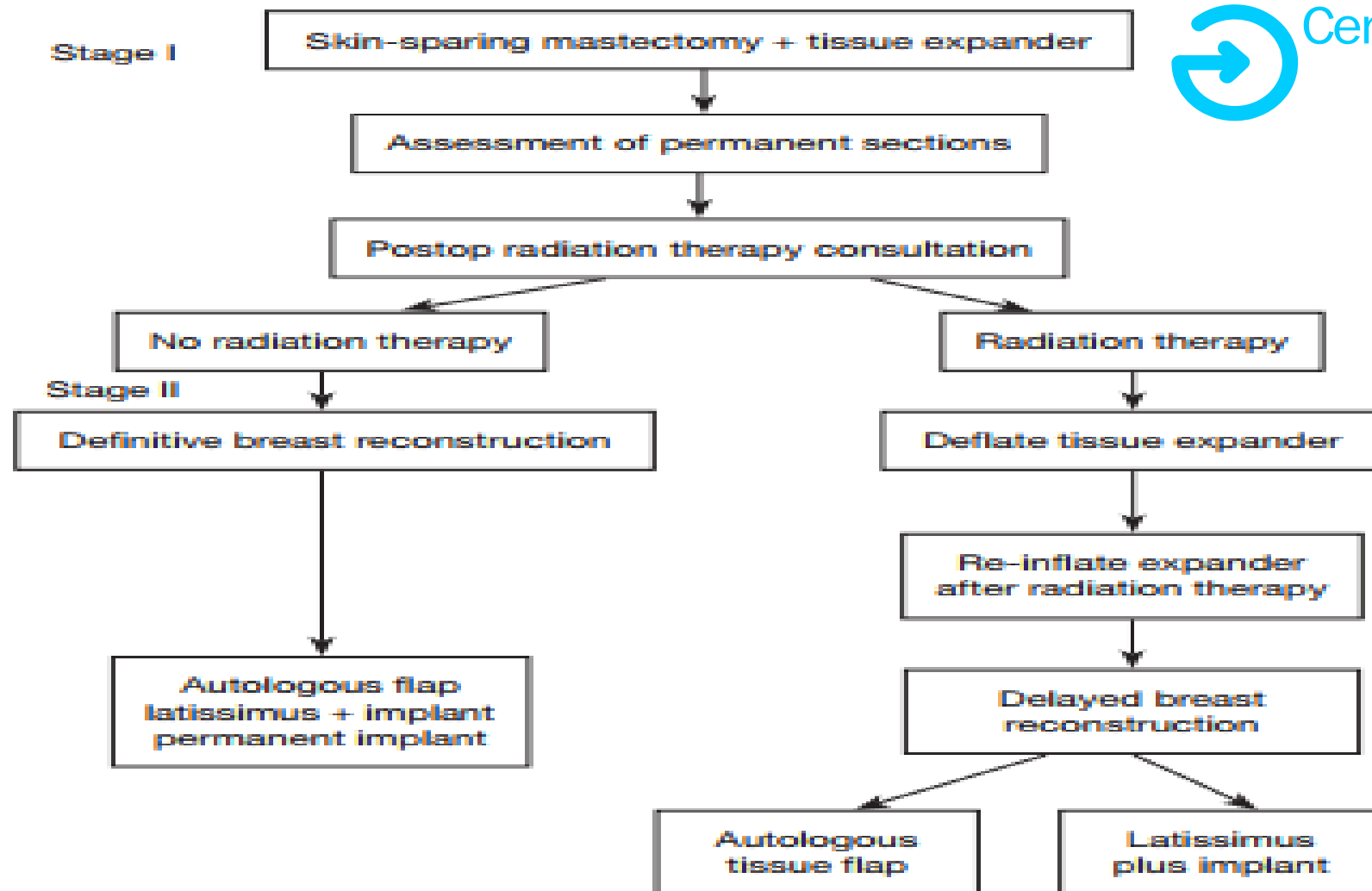
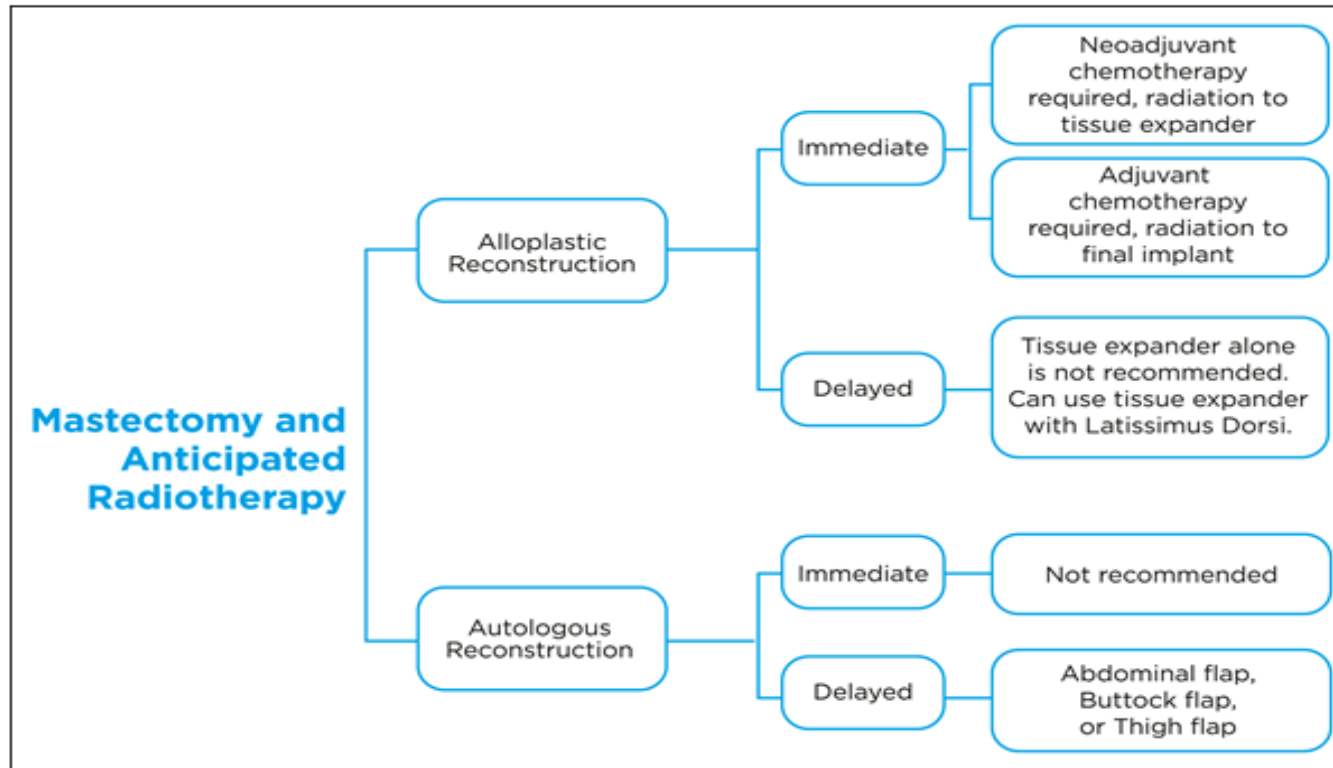


Figure 6 Delayed-immediate breast reconstruction.

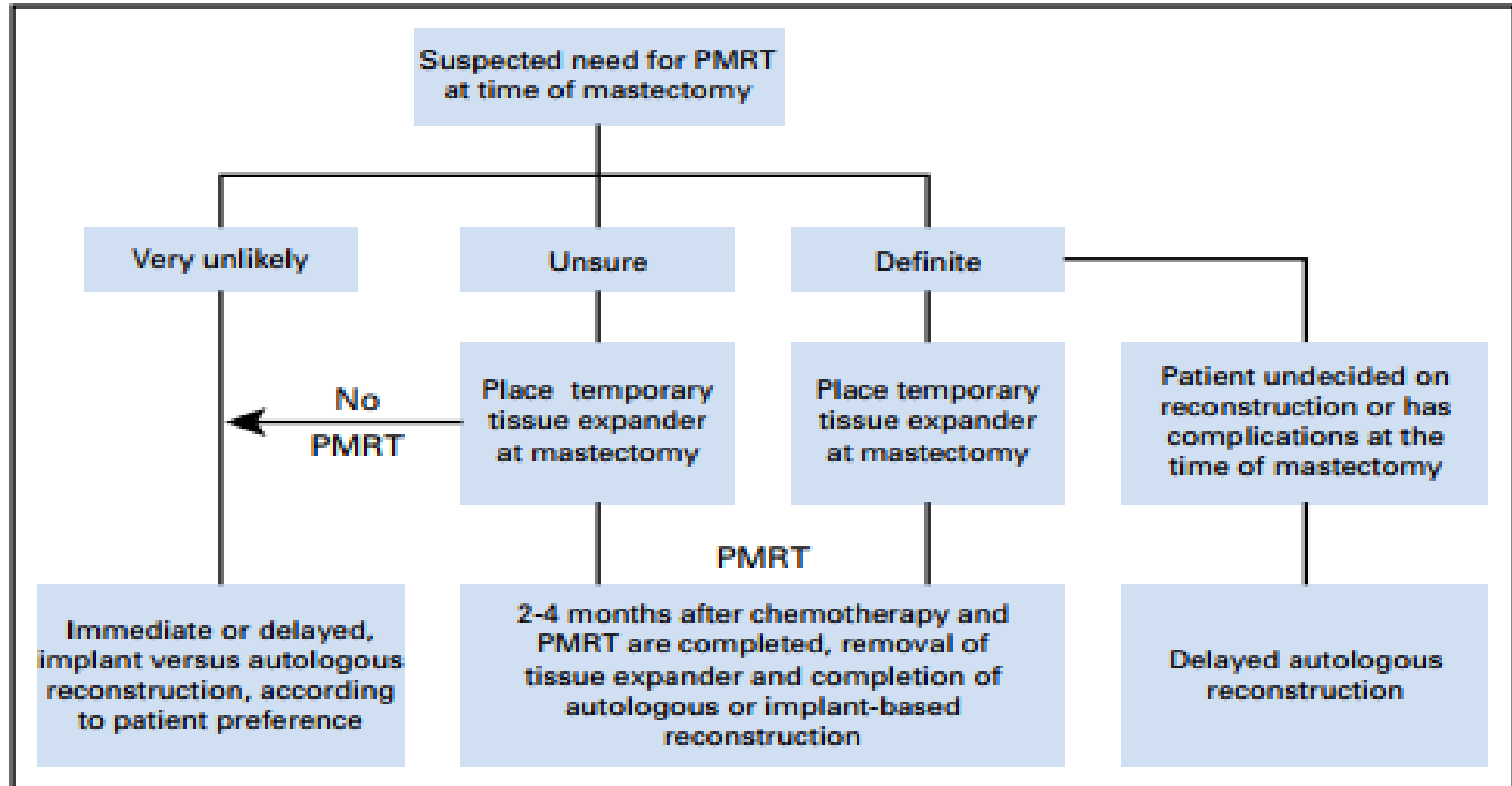
Memorial Sloan Kettering Cancer Center perspective

Breast Reconstruction Management Algorithm When Postmastectomy Radiation Is Anticipated



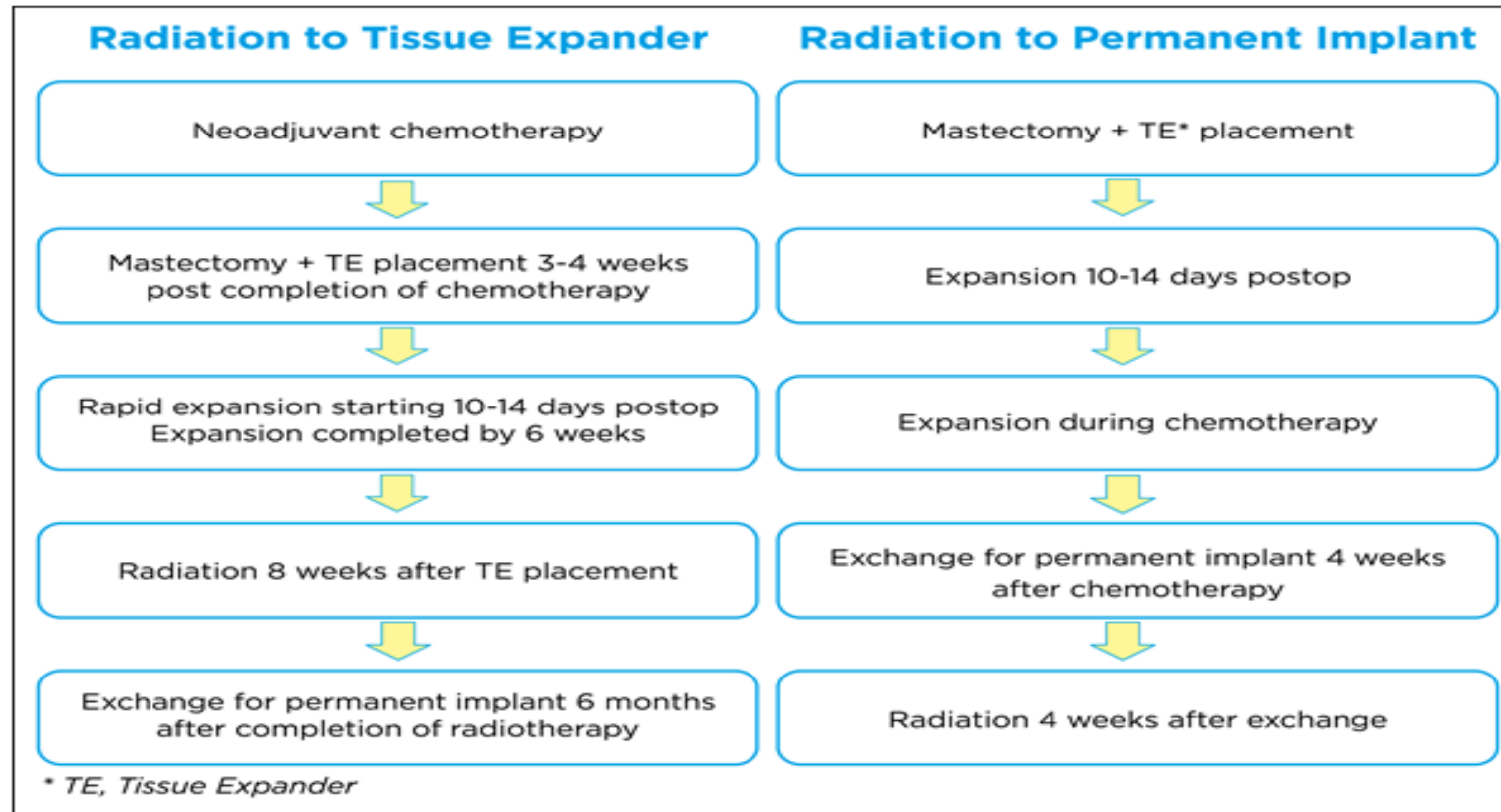
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Breast Reconstruction With Postmastectomy Radiation: Choices and Tradeoffs



Zabiegi rekonstrukcyjne a leczenie systemowe: przed i pooperacyjne

Timing and Sequence of Immediate Two-Stage Prosthetic Breast Reconstruction With Mastectomy, Chemotherapy, and Radiation



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Optimizing Breast Cancer Adjuvant Radiation and Integration of Breast and Reconstructive Surgery
Meeting Library 01.08.2017

PMRT a zabiegi rekonstrukcyjne



Immediate tissue expander followed by subsequent bilateral implant reconstruction in the setting of prior right breast radiation



Immediate tissue expander followed by PMRT to the left chest wall with subsequent bilateral free-flap autologous reconstruction

PMRT vs no PMRT

IMPLANT BASED RECONSTRUCTION:

- capsular contracture (BAKER 3-4): 41% vs 14,5 %
- reconstruction complications: infection, wound dehiscence, hematoma, seroma, back pain: 68% vs 31%
- Failure removal of the implant: 37% vs 8%

AUTOLOGOUS RECONSTRUCTION

- complication rate : unplanned operation: 42% vs 16%
- removal rate (for autologous and implant combined with PMRT) 31% vs 6 %

Increase in general complication rate : 2-3 fold

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JOURNAL OF CLINICAL ONCOLOGY

ONCOLOGY GRAND ROUNDS

Breast Reconstruction With Postmastectomy Radiation: Choices and Tradeoffs

Matthew M. Poppe and Jayant P. Agarwal, University of Utah, Salt Lake City, UT
See accompanying article on page 2499

What Is the Optimum Timing of Postmastectomy Radiotherapy in Two-Stage Prosthetic Reconstruction: Radiation to the Tissue Expander or Permanent Implant?

- radiation to the tissue expander, or to the permanent implant : 2003 to 2012
- 1486 reconstructions without radiation,
- 94 reconstructions with tissue expander RT,
- 210 reconstructions with permanent implant RT

Results:

- Six-year predicted failure rates: patients with TE- tissue expander radiation vs patients with permanent implant (PI) radiation (32 percent versus 16.4 percent; $p < 0.01$).
- proportion of very good to excellent aesthetic results: patients with TE tissue expander radiation vs patients with PI permanent implant radiation: 75.0 percent versus 67.6 percent; $p < 0.01$

Optimal Sequencing of Postmastectomy Radiotherapy and Two Stages of Prosthetic Reconstruction: A Meta-analysis.

-eight studies were analyzed, representing 899 cases.

-no III phase randomised studies

-the risks for reconstruction failure and major complication requiring reoperation tended to be higher in the group with PMRT to tissue expanders compared to that with PMRT to implants,

-the group with PMRT to tissue expanders had a significantly lower risk of severe capsular contracture (relative risk, 0.44; $P < 0.001$)

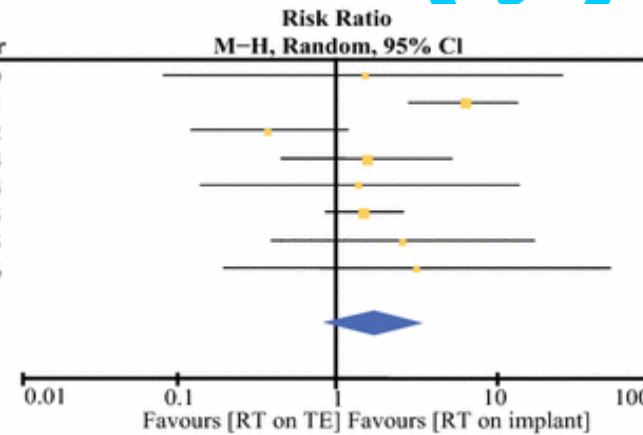
Ann Surg Oncol.2017 May;24(5):1262-1268.

A meta-analysis of implant based breast reconstruction and timing of adjuvant radiotherapy.

Adverse event	All patients	RT to expander	RT to permanent imp	P value
Reconstruction Failure	17,6%	20%	13,4%	0,001
Capsule constraction	37,5%	24,5%	49,4%	0,001

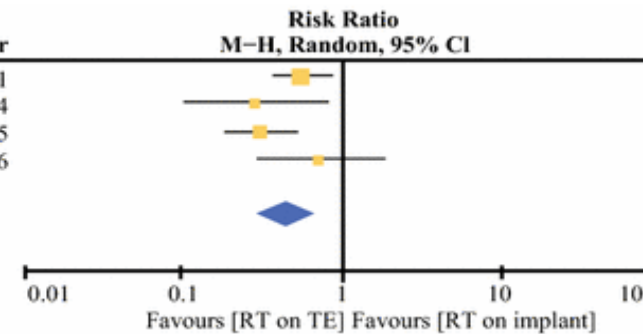


Study or Subgroup	RT on TE		RT on Implant		Weight	Risk Ratio		Year
	Events	Total	Events	Total		M-H, Random, 95% CI		
Anderson 2009	3	62	0	12	5.3%	1.44 [0.08, 26.31]	2009	
Nava 2011	20	50	7	109	19.6%	6.23 [2.82, 13.76]	2011	
Aristei 2012	9	90	3	11	15.8%	0.37 [0.12, 1.15]	2012	
Lentz 2014	7	34	3	22	14.9%	1.51 [0.44, 5.23]	2014	
Collier 2014	2	32	1	22	7.3%	1.38 [0.13, 14.25]	2014	
Cordeiro 2015	17	94	26	210	22.0%	1.46 [0.83, 2.56]	2015	
Fowble 2015	17	94	1	13	9.5%	2.57 [0.37, 17.72]	2015	
Yan 2016	5	41	0	11	5.5%	3.14 [0.19, 52.89]	2016	
Total (95% CI)		489		410	100.0%	1.72 [0.81, 3.64]		
Total events	80		41					
Heterogeneity: Tau ² = 0.59; Chi ² = 18.01, df = 7 (P = 0.01); I ² = 61%								
Test for overall effect: Z = 1.41 (P = 0.16)								



Forest plot comparing pooled risk of **reconstruction failure** between group with PMRT to tissue expander and that to implant

Study or Subgroup	RT on TE		RT on Implant		Weight	Risk Ratio		Year
	Events	Total	Events	Total		M-H, Random, 95% CI		
Nava 2011	16	50	62	109	38.5%	0.56 [0.36, 0.87]	2011	
Lentz 2014	4	34	9	22	13.2%	0.29 [0.10, 0.82]	2014	
Cordeiro 2015	13	94	94	210	32.5%	0.31 [0.18, 0.52]	2015	
Yan 2016	11	41	4	11	15.8%	0.74 [0.29, 1.87]	2016	
Total (95% CI)		219		352	100.0%	0.44 [0.29, 0.68]		
Total events	44		169					
Heterogeneity: Tau ² = 0.07; Chi ² = 4.98, df = 3(P = 0.17); I ² = 40%								
Test for overall effect: Z = 3.75 (P = 0.0002)								



Forest plot comparing pooled risk of **severe capsular contracture** between group with PMRT to tissue expander and that to implant

Ann Surg Oncol. 2017 May;24(5):1262-1268.

Optimal Sequencing of Postmastectomy Radiotherapy and Two Stages of Prosthetic Reconstruction: A Meta-analysis.

Pooled RRs for adverse outcomes between group receiving PMRT on tissue expander and implant

Outcome	No. of studies	No. of cases		RR	95% CI	P
		RT on TE	RT on implant			
Reconstruction failure	8	489	410	1.72	0.81–3.64	0.16
Infection	4	169	67	1.65	0.72–3.78	0.23
Severe capsular contracture	4	219	352	0.44	0.29–0.68	<0.001
Major complication	3	135	45	3.29	0.76–14.25	0.11
Minor complication	3	135	45	0.94	0.53–1.69	0.84

CI confidence interval, *PMRT* postmastectomy radiotherapy, *RR* relative risk, *RT* radiotherapy, *TE* tissue expander

Ann Surg Oncol. 2017 May;24(5):1262-1268.

Optimal Sequencing of Postmastectomy Radiotherapy and Two Stages of Prosthetic Reconstruction: A Meta-analysis.

Is immediate autologous breast reconstruction with postoperative radiotherapy good practice?: A systematic review of the literature

ImmediateAutologous BR+RT vs IABR

Table 1 Observational studies that compared complications and aesthetic outcomes in patients who underwent immediate autologous breast reconstruction and postoperative radiotherapy with patients that did not receive radiotherapy before or after surgery. Results for patients that received postoperative radiotherapy are reported first.

Study	Level of evidence	No. pts not receiving DXT	No. pts receiving post-recon DXT	Radiation dose (Gy) and regimen	Flap type	Follow-up	Complications	Fat necrosis	Revisional surgery	Loss of volume	Aesthetic outcome
Berry et al., 2010 ²⁵	3b (level B)	274	78	NK	ALD; pedicled TRAM; free TRAM; DIEP	—	25.6% (cw 32.5%)	—	—	—	—
Lee et al., 2010 ²⁷	3b (level B)	371	36	NK	ALD; pedicled TRAM; free TRAM; DIEP; SIEA; SGAP	63.6 months (cw 56.8 months)	Early 11.1% (cw 10.5%); late 19.4% (cw 10.5%)	11.1% (cw 11.6%)	5.6%	—	General 75% (cw 74.1%); Aesthetic 66.7% (cw 75.7%)
Leonardi et al., 2010 ⁴¹	4 (level C)	26	7	Up to 50.4 Gy, no bolus	—	—	—	—	—	—	47.6% good to excellent (cw 68.6%*)
Chatterjee et al., 2009 ³³	3b (level B)	46	22	45 Gy (20 fractions)	DIEP	Median 41 months	—	—	13.6% (cw 17.4%)	No difference	—
Carlson et al., 2008 ³¹	3b (level B)	149 flaps	25 flaps	NK	Pedicled TRAM	≥12 months	44% (cw 34.2%)	32% (cw 14.6%)	12% (cw 19%)	—	Aesthetic score 5.89 (cw 5.83); Global score 2.56 (cw 3.02)
Thomson et al., 2008 ³⁰	2b (level B)	7	13	50 Gy (25 fractions) in 77%; 46 Gy (20 fractions) in 23%	ALD	Mean 32.5 months	—	0%	—	—	3.3 (cw 4.5); Cosmesis score: 4 (cw 4)
Spear et al., 2005 ⁴²	3b (level B)	78	34	NK	Pedicled TRAM	—	50% (cw 49.5%)	23.7% (cw 12.1%)	Significantly less in control group	—	Significantly better in control group
Rogers and Allen, 2002 ⁴⁴	3b (level B)	30	30	Mean 50.5 (44–61.2 Gy)	DIEP	Mean 14 months (cw 19.9 months)	—	23.3% (cw 0%*)	16.7% (cw 0%*)	56.7% (cw 0%*)	Significantly better in control group
Tran et al., 2000 ⁴⁵	4 (level C)	1443	41	50.99 Gy over 5 weeks	TRAM (32 free; 9 pedicled)	≥12 months; mean 36 months	—	34% (cw 7%*)	24%	78%	Loss of symmetry in 78%; significantly better in control group

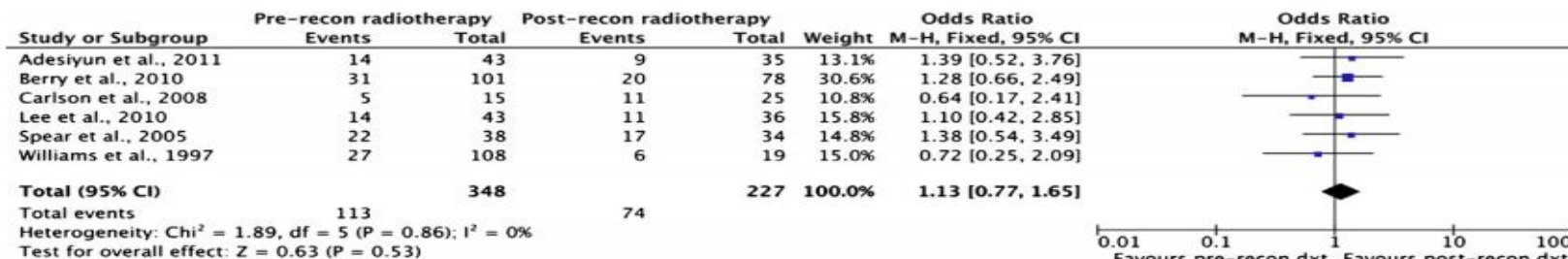


Is immediate autologous breast reconstruction with postoperative radiotherapy good practice?: A systematic review of the literature

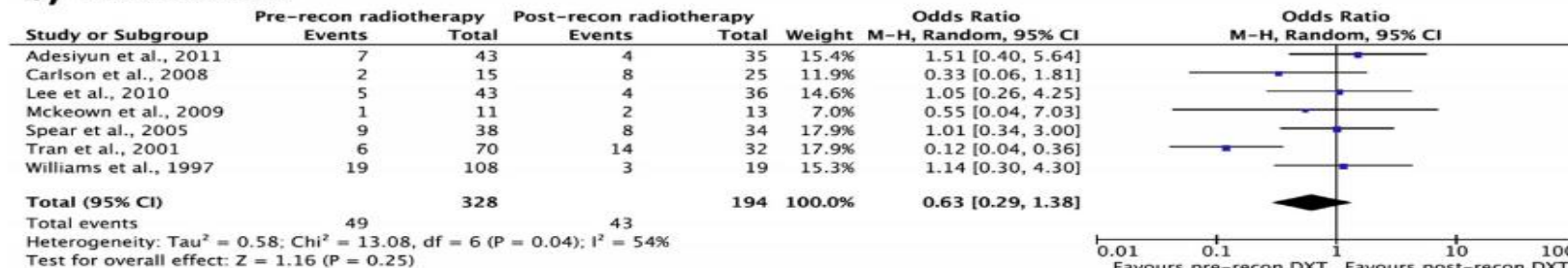
Mark V. Schaverien ^{a,b,*}, R. Douglas Macmillan ^{a,b},
Stephen J. McCulley ^{a,b}

ABR+RT vs RT+ABR

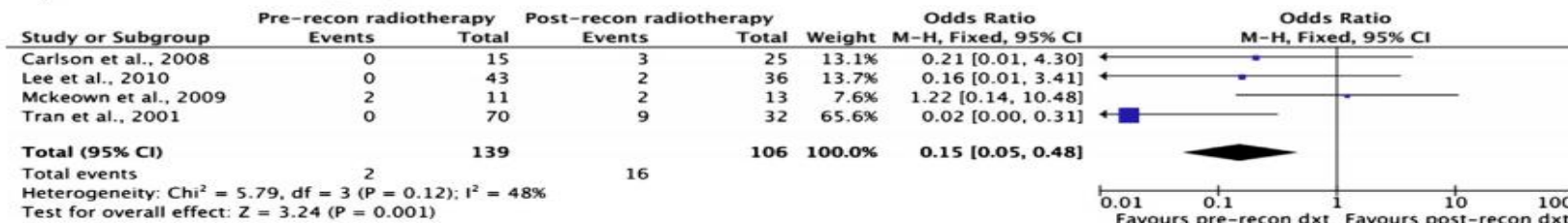
a) Overall complications



b) Fat necrosis



c) Revisional surgery



Reconstruction of the Irradiated Breast: A National Claims-Based Assessment of Postoperative Morbidity.

[Plast Reconstr Surg.](#) 2017 Apr;139(4):783-792.

BACKGROUND:

-to assess the morbidity associated with various breast reconstruction techniques in irradiated patients.

METHODS:

-breast cancer patients who had undergone mastectomy, irradiation, and breast reconstruction from 2009 to 2012.

RESULTS:

- 4781 pts irradiated patients

-3846 (80 percent)] underwent reconstruction with implants.

Overall complication rates : **45.3 % vs 30.8 % for patients with implant and autologous reconstruction respec**

Failure of reconstruction occurred in **29.4 %** for implant reconstruction and **4.3 %** for autologous reconstruction.

Multivariable logistic regression:

PMRT for implant reconstruction - two times the odds of having any complication and 11 times the odds of failure relative to patients with autologous reconstruction.

CONCLUSIONS:

Implant-based breast reconstruction in the irradiated patient, although popular, is associated with significant morbidity.

Failures of reconstruction with implants in these patients approach 30 percent in the short term, suggesting a need for careful shared decision-making, with full disclosure of the potential morbidity

Patients reported outcome:

Journal of Plastic, Reconstructive and Aesthetic Surgery. (2017) 70, 768-780

-systematic review 2000-2016, 1611 patients:

Positive aesthetic outcomes ("good" or "better") :

- in patients with prosthetic reconstruction and ranged from 36% to 100%.

- positive aesthetic outcomes following autologous reconstruction ranged from 70% to 90%.

Reference	Patients (n)	Satisfaction with breast	Satisfaction with outcome	Psychosocial well-being	Sexual well-being	Physical well-being
Cordeiro et al. 2015 ³¹	84 ^a	56.2	68.4	71.1	54.0	72.5
	22 ^b	57.2	70.2	72.3	55.4	73.4
Albornoz et al. 2014 ⁵¹	172	57.0	64.9	65.2	45.4	71.7
Eriksson et al. 2013 ⁴⁹	197	50.9	63.8	63.9	48.2	75.1
McCarthy et al. 2010 ⁵⁰	100	48.9	–	–	–	–

a Involves patients with PMRT applied to permanent implant.

b Involves patients with PMRT applied to tissue expander.

Table 2 Overall ranges of aesthetic outcome, patient satisfaction, and BREAST-Q® scores of included studies.

	Number of studies	Patients (n)	Outcomes following autologous reconstruction	Outcomes following prosthetic reconstruction
Aesthetic outcome				
5-Point categorical scale	6	705	Aesthetic mean; 2.94–3.84	Excellent/very good; 36–67.6%, Good; 24.6–44%, Fair/poor; 0–38%
4-Point categorical scale	12	680	Excellent/good; 70–90%, Fair/poor; 10–30%, Aesthetic mean; 2.3–3.0	Excellent/good; 36.1–90%, Fair/poor; 10–63.9%
3-Point categorical scale	1	116	—	Good; 46.2–52.2%, Medium; 36.6–46.2%, Bad; 7.6–11.1%
3-Point scoring scale (0–2)	1	49	—	Volume; 1.45, Contour; 1.43, Placement; 1.51, Inframammary fold; 1.58, Scarring; 1.43
Acceptable vs. unacceptable cosmesis	1	92	Acceptable; 82.6%, Unacceptable; 17.4%	Acceptable; 51%, Unacceptable; 49%
Patient satisfaction				
Proportion of satisfied patients	6	647	Satisfied patients; 74–75%	Satisfied patients; 41–90%
5-Point satisfaction scale	2	75	Satisfaction mean; 4.4–4.6	Satisfaction mean; 2.8
BREAST-Q® scores	4	575	—	Satisfaction of breasts; 48.9–57.2, Satisfaction with outcome; 63.8–70.2, Psychosocial well-being; 63.9–72.3, Sexual well-being; 45.4–55.4, Physical well-being; 71.7–75.1

Impact of Radiotherapy on Complications and Patient-Reported Outcomes After Breast Reconstruction.

Jagsi R, J Natl Cancer Inst.2018 Feb 1;110(2)

Patients considering postmastectomy radiation and reconstruction require information regarding expected outcomes to make preference-concordant decisions.

-a prospective multicenter cohort study of women diagnosed with breast cancer at **11 centers between 2012 and 2015** : 622 irradiated and 1625 unirradiated patients who received reconstruction.

RESULTS:

Autologous reconstruction was more commonly received by irradiated patients (37.9% vs 25.0%, $P < .001$).

Immediate reconstruction was less common in irradiated patients (83.0% vs 95.7%, $P < .001$).

At least one breast complication had occurred by two years : 38.9% of irradiated patients with implant reconstruction, 25.6% of irradiated patients with autologous reconstruction,

Multivariable analysis showed **bilateral treatment and higher body mass index to be predictive of developing a complication**, with a statistically significant interaction between radiotherapy receipt and reconstruction type.

Complications: PMRT: autologous reconstruction was associated with a lower risk of complications than implant-based reconstruction at two years (odds ratio [OR] = 0.47, $P = .007$);

Satisfaction with breasts : autologous vs implant approaches (63.5, vs 47.7, in irradiated patients than between autologous vs implant approaches (67.6 vs 60.5 in unirradiated patients.

CONCLUSIONS:

Autologous reconstruction appears to yield superior patient-reported satisfaction and lower risk of complications than implant-based approaches among patients receiving postmastectomy radiotherapy

- In the previously radiated patients, the use of tissue expanders/implants is relatively contraindicated. Tissue expansion of irradiated skin can result in a significantly increased risk of capsular contracture, malposition, poor cosmesis, implant exposure, and failed reconstruction. In the setting of previous radiation, autologous tissue reconstruction is the preferred method of breast reconstruction.

- ▶ When post-mastectomy radiation is required and autologous tissue reconstruction is planned, reconstruction is either delayed until after the completion of radiation therapy, or it can be initiated at the time of mastectomy with tissue expander placement followed by autologous tissue reconstruction. While some experienced breast cancer teams have employed protocols in which immediate tissue reconstructions are followed by radiation therapy, it is generally preferred that the radiation therapy precede the placement of the autologous tissue, because of reported loss in reconstruction cosmesis (category 2B).

- ▶ When implant reconstruction is planned in a patient requiring radiation therapy, a staged approach with immediate tissue expander placement followed by implant placement is preferred. Surgery to exchange the tissue expanders with permanent implants can be performed prior to radiation or after completion of radiation therapy. Immediate placement of an implant in patients requiring postoperative radiation has an increased rate of capsular contracture, malposition, poor cosmesis, and implant exposure.

DEGRO practical guidelines for radiotherapy of breast cancer: radiotherapy following mastectomy for invasive cancer

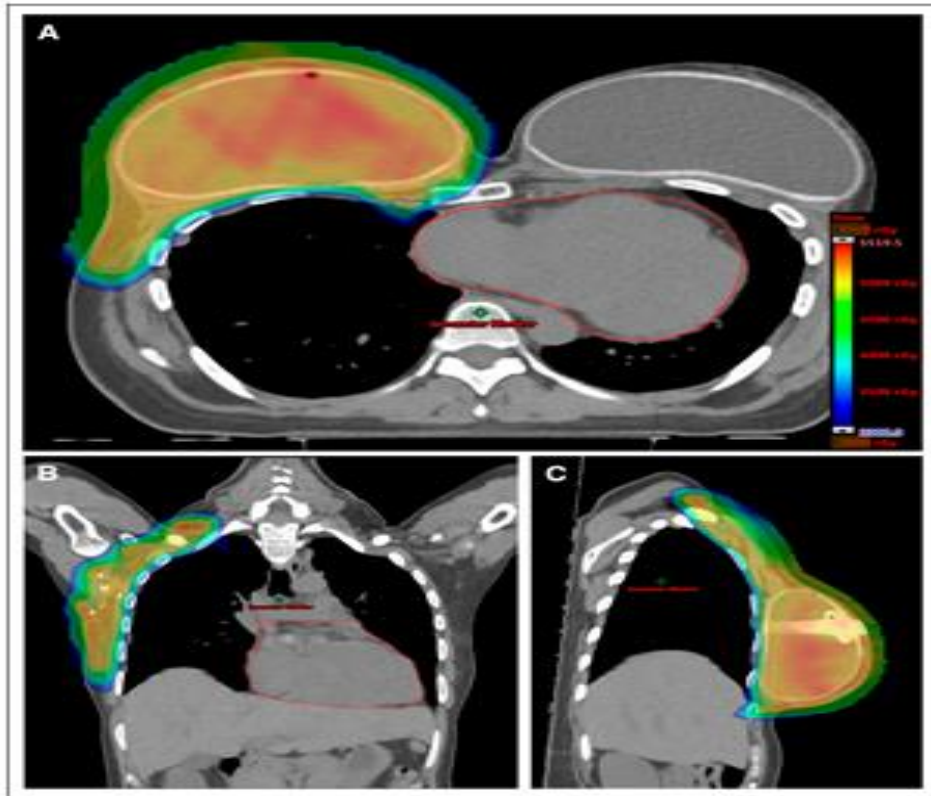
Strahlenther Oncolgy 2014;190:705-714

.....

- evidence is accumulating that PMRT with modern radiotherapy techniques, reconstruction using autologous material or implants or both are options*
- implanting expanders before definitive reconstruction and finished skin expansion prior to starting PMRT seems to be feasible and results in good patients satisfaction.*
- Physicians and patients should be aware of reasonable implant removal rate and toxicities such as fibrosis.*

.....

PMRT a zabiegi rekonstrukcyjne – planowanie radioterapii



- techniki planowania,
- aspekty fizyczne rozkładu dawki w ekspanderze,
- obszary napromieniania
- dawki , sposób frakcjonowania,
- powikłania radioterapii – odczyny wczesne i późne.

Specific protocol of PMRT of included studies

Study	PMRT protocol					
	Dose (Gy)	Fraction No.	Total dose (Gy)	Bolus	Boost	Inflation state of TE
Anderson 2009 ¹⁰	1.8–2.0	25–28	50–50.4	Used in all cases	Used in 1 case (10 Gy)	NA
Aristei 2012 ²⁷	1.8–2.0	25–28	50–50.4	Used in 3 cases	Used in 2 cases (10 Gy)	NA
Collier 2014 ²⁸	NA	NA	NA	NA	NA	NA
Cordeiro 2015 ¹¹	1.8–2.0	25–28	50–50.4	–	–	Fully expanded
Fowble 2015 ²⁹	1.8–2.0	25–28	50–50.4	Used in all cases	Not used	Fully expanded
Lentz 2013 ³⁰	NA	NA	NA	NA	Used in 1 case	NA
Nava 2011 ¹²	1.8–2.0	25–28	50–50.4	NA	NA	Fully expanded
Yan 2016 ³¹	1.8–2.0	25–28	50–50.4	Used in 9 cases	Used in 12 cases	Deflated

NA not applicable, PMRT postmastectomy radiotherapy, TE tissue expander

Ann Surg Oncol. 2017 May;24(5):1262-1268.

Optimal Sequencing of Postmastectomy Radiotherapy and Two Stages of Prosthetic Reconstruction: A Meta-analysis.



EKSPANDERY TKANKOWE
TEKSTUROWANE



EKSPANDERY TKANKOWE GŁADKIE

PRZECIWWSKAZANIA WZGLĘDNE/ŚRODKI OSTROŻNOŚCI

- Opadnięte piersi, gdzie sutek znajduje się poniżej fałdu piersiowego, bez współistniejącej mastopeksji.
- Na właściwą jakość tkanek służących do pokrycia implantu mogą w różnym stopniu mieć negatywny wpływ uszkodzenia wskutek promieniowania, owrzodzenia, upośledzenie unaczynienia lub trudności w gojeniu ran.
- Poprzednie nieudane wielokrotne korekty kształtu piersi.
- Pacjentki, które mają zostać poddane naświetlaniu i/lub chemioterapii, gdyż te metody terapeutyczne utrudniają zastosowanie implantów piersi oraz ekspanderów tkanek oraz zwiększają ryzyko wystąpienia powikłań.
- Warunki fizjologiczne, które według chirurga stanowią zbyt duże ryzyko wystąpienia powikłań w trakcie i/lub po operacji. Na to, czy pacjentka kwalifikuje się do wszczepienia implantów, mogą w różnym stopniu mieć wpływ nadwaga, palenie tytoniu, cukrzyca, choroba autoimmunologiczna, koagulopatia, przewlekła choroba płuc lub ostra niewydolność sercowo-naczyniowa.

Investigation into dosimetric effect of a MAGNA-SITE™ tissue expander on post-mastectomy radiotherapy

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It is increasingly common for radiotherapy departments to encounter high density objects in patients being planned for radiotherapy. Many cases, such as artificial hip prostheses, are well documented. In our cancer center we have recently come across a new type of implant—a McGhan Style 133 Tissue Expander—implanted in patients who have undergone a mastectomy and will in future have breast reconstruction. This type of implant contains a small rare earth magnet encased in a titanium body, which induces significant perturbations in the dose distribution. These perturbations have been measured using a p-type semiconductor diode. Attenuation of up to 30% of local dose has been observed for a single beam. However, in more realistic clinical situations using tangential parallel opposed beams, it is estimated that part of the planning target volume maybe be underdosed by approximately 10%. Comparisons have been made between measured attenuation and that calculated by a treatment planning system, which demonstrates inadequate modeling of the dose perturbation caused by the implant in this case. © 2005 American Association of Physicists in Medicine. [DOI: 10.1118/1.1914545]

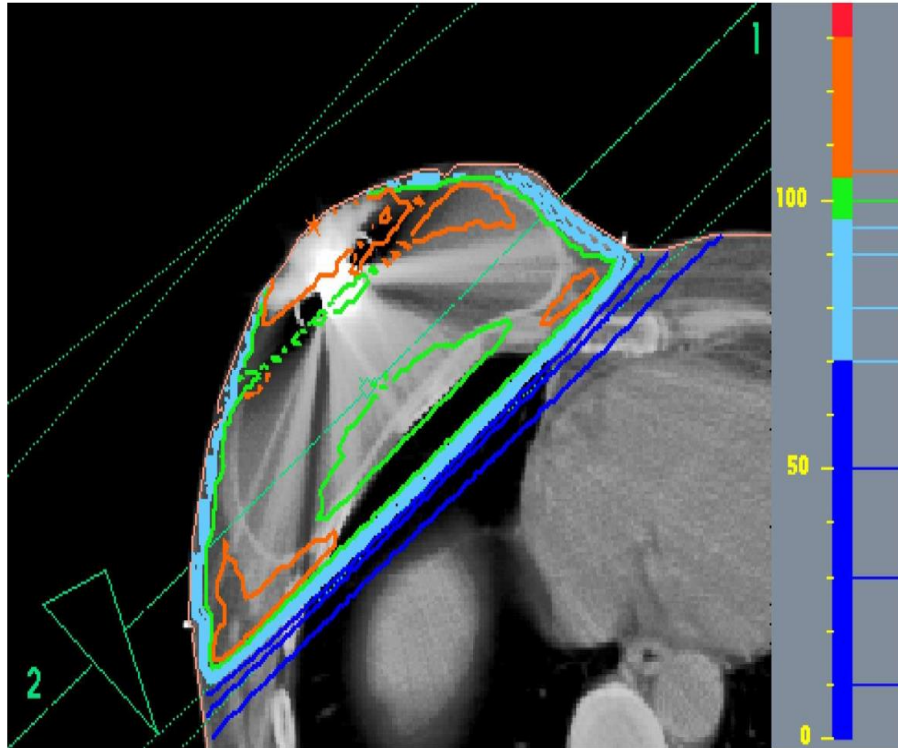
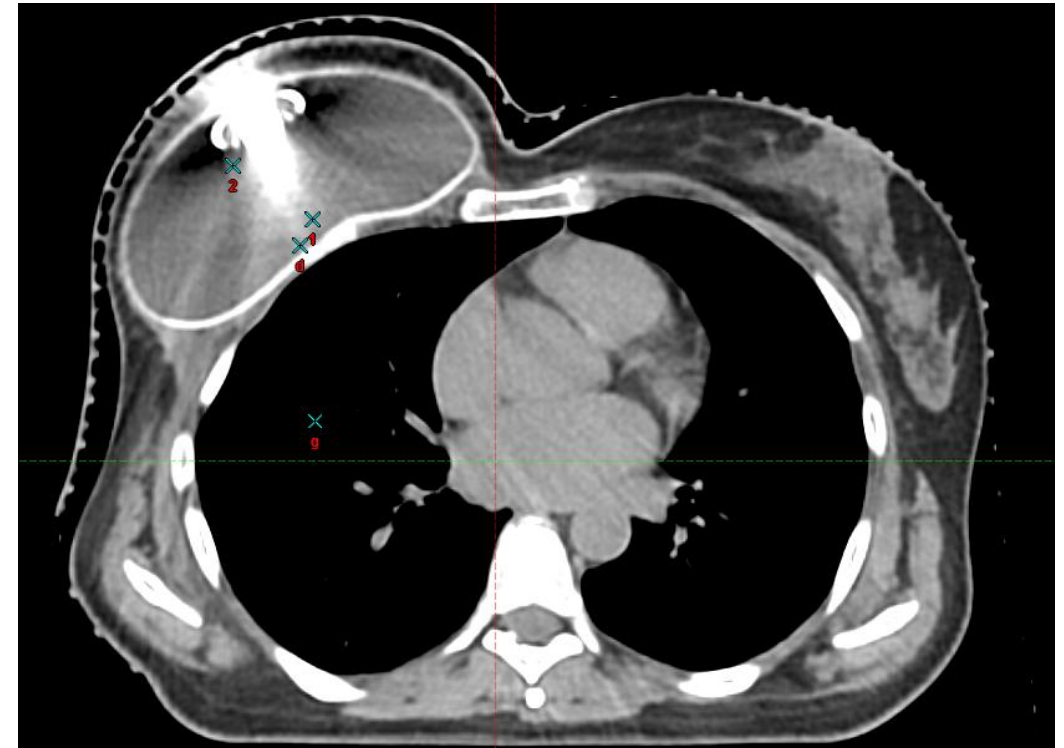


FIG. 1. Axial Sim-CT slice of McGhan Style 133 Tissue Expander *in situ* with the dose distribution calculated by Helax TMS. The percentage isodose scale is defined on the right.



No difference in dose distribution in organs at risk in postmastectomy radiotherapy with or without breast implant reconstruction

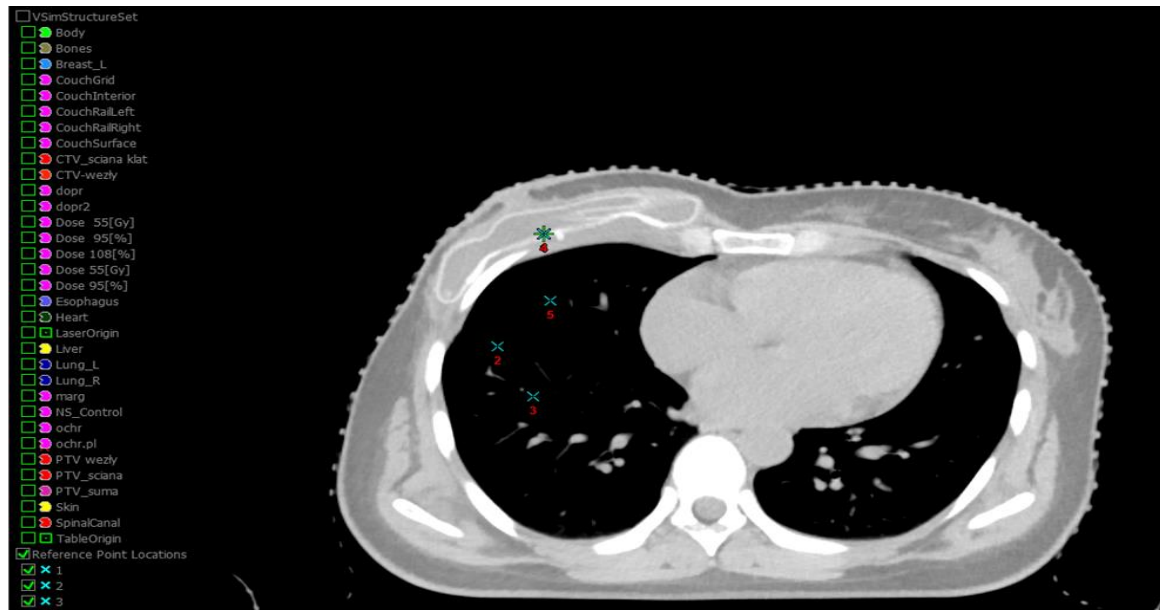
Radiation Oncology 2014, **9**:14 doi:10.1186/1748-717X-9-14

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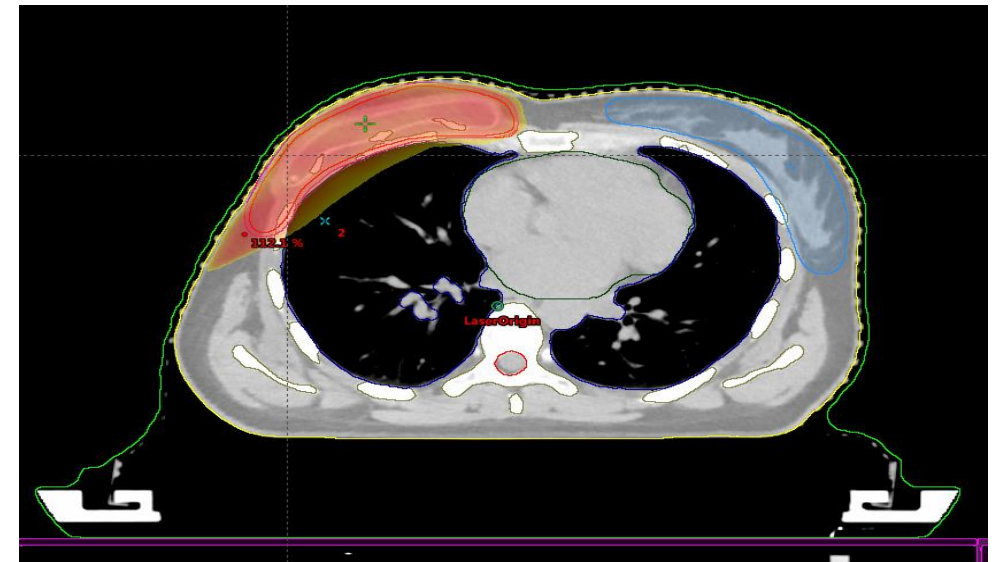
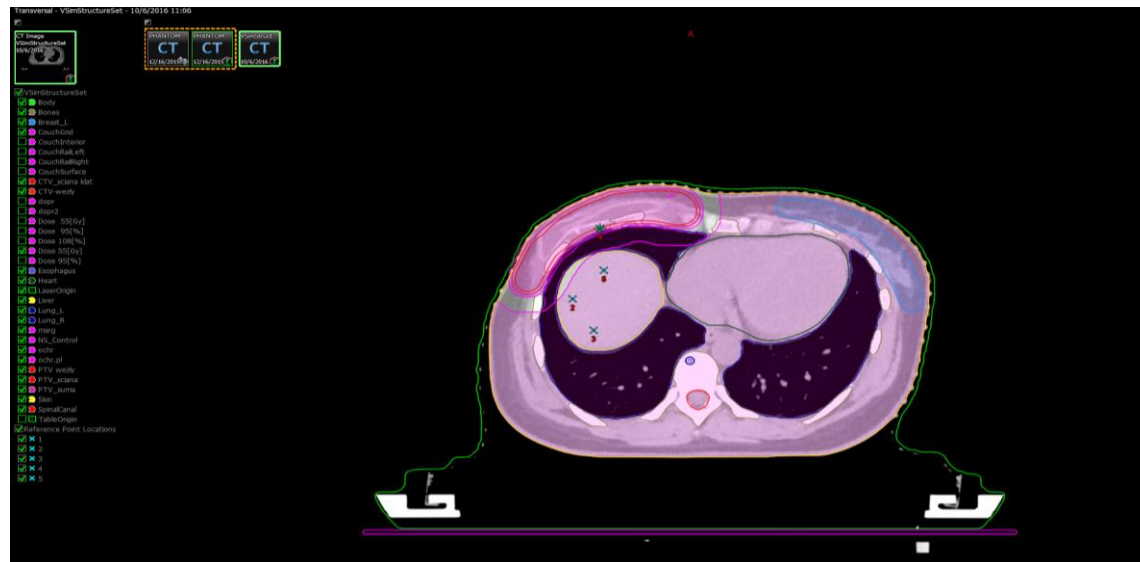
- Trzy typy implantów: tymczasowe z portem magnetycznym, z zewnętrzną komorą silikonową, permanentne z silikonem.
- Dwa pola naprzeciwległe (Eclipse AAA).
- Brak informacji na temat redukcji artefaktów.
- Badanie retrospektywne.
- Wnioski:
 - brak różnic w rozkładach dawki w OAR i w targecie
 - konieczne dalsze badania

Problemy nawet nie zasygnalizowane:

- ☐- Brak możliwości określenia materiału ekspandera (za duże HU).
- ☐-Błędne wyznaczenie rozkładu dawki w planie.
- ☐-Problem optymalizatora przy planach dynamicznych.



Planowanie PMRT z ekspanderem- dwuetapowa rekonstrukcja



Chora lat 48., po raz pierwszy w I.O., skierowany z rozpoznaniem: Rak piersi prawej T3N0M0. Stan po chemioterapii. Stan po amputacji z jednoczasową rekonstrukcją ekspanderem.

pT1c pN0 M0.

W trakcie hormonoterapii.

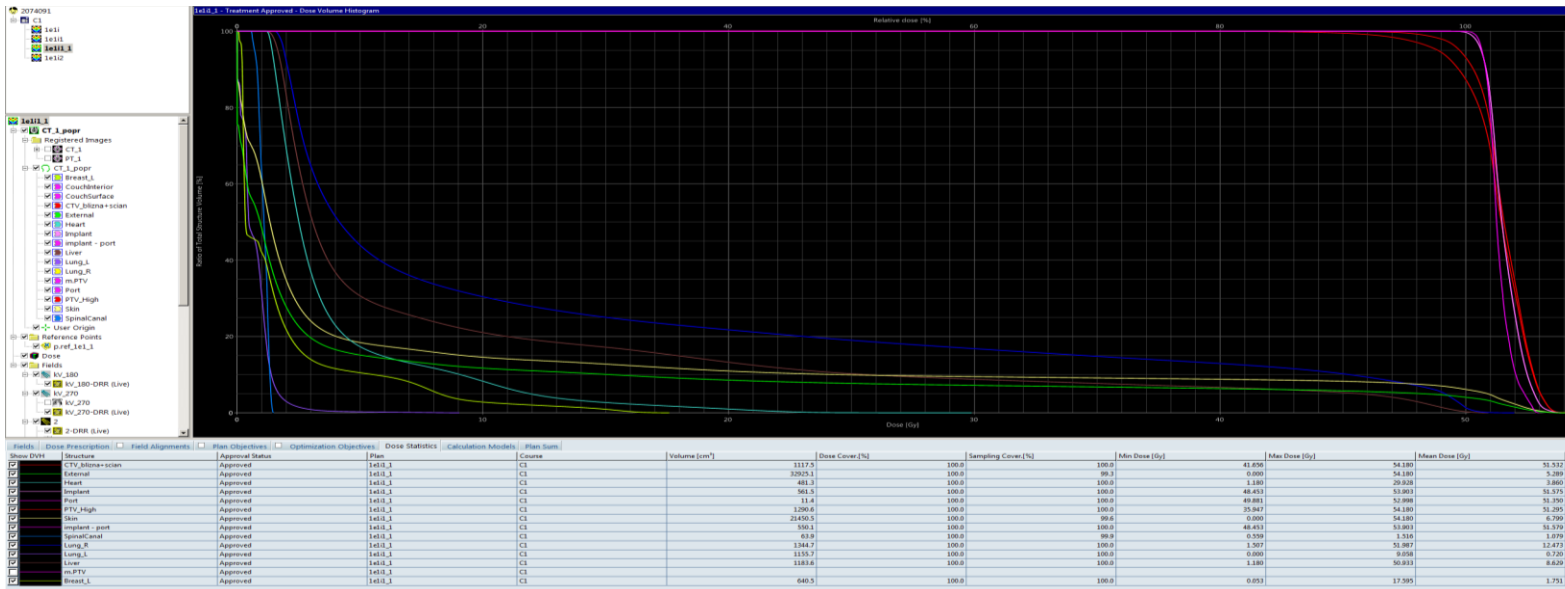
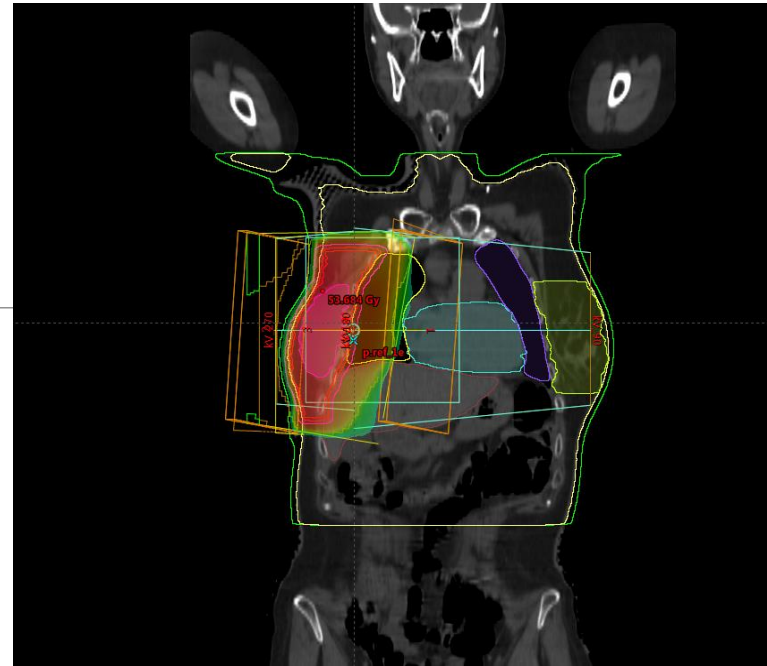
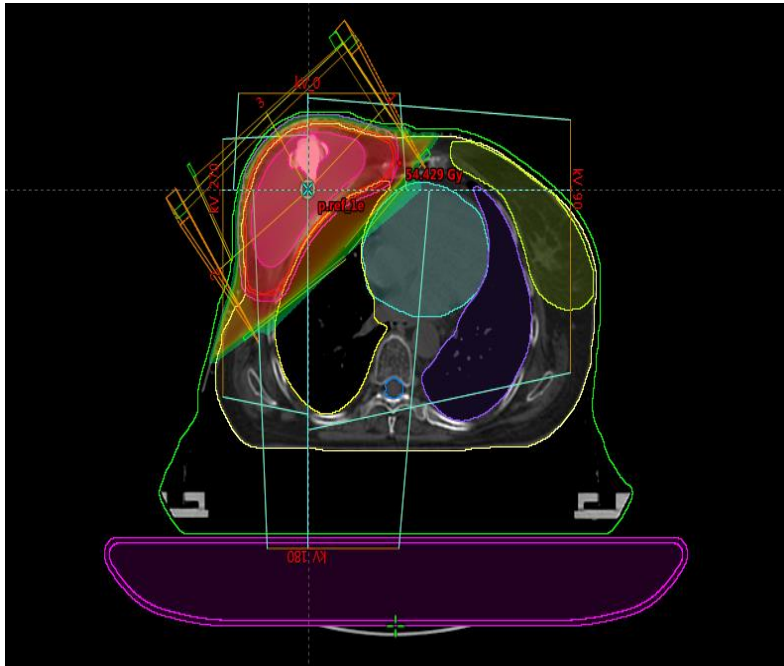
H-P. Carcinoma invasivum ducto-lobulare NG2.

ER (+) 8 pkt w skali Allreda (3+5), PR (+) 8 pkt w skali Allreda (3+5), HER-2 (0) negatywny, Ki 67>20-30%

Pacjentka zakwalifikowana do pooperacyjnej radioterapii. Napromieniana fotonami X 6 MV w obszarze blizny się ze ścianą klatki piersiowej i obszarem zrekonstruowanej piersi za pomocą ekspandera z marginesem.

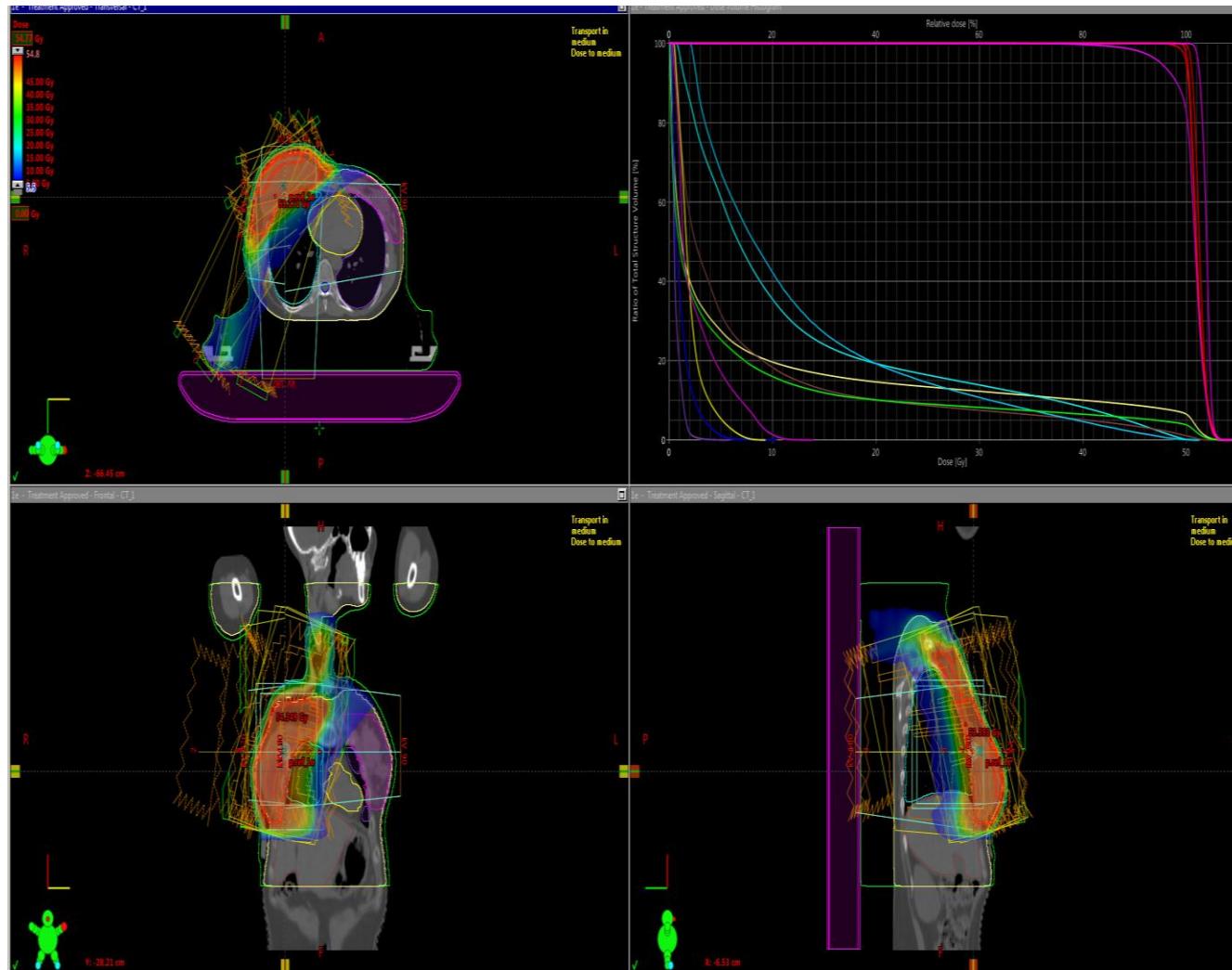
Podano dawkę 50 Gy/g we frakcjonowaniu konwencjonalnym.

Obserwowano odczyn popromienny ze strony skóry II wg EORTC.



Chora lat 40 skierowany z rozpoznaniem: Rak piersi prawej cT2(m)N0M0. Stan po SSM pT2m pN1 M0 (ogniskowo dodatni margines). W trakcie hormonoterapii. Stan po radykalizacji.
HP: Invasive carcinoma NST G2. NG2. IM: 1/10 HPF. Podtyp biologiczny: luminalny A,

Po ocenie całości obrazu klinicznego oraz po omówieniu z Pacjentką wskazań, korzyści i ryzyka, zakwalifikowana do radioterapii. Napromieniana fotonami X 6 i 20 MV w obszarze blizny ze ścianą klatki piersiowej z objęciem implantu i węzłów chłonnych pod i nadobojcza. Podano dawkę 50 Gy/g w 25 dfx a 2 Gy/g a następnie podwyższono dawkę na obszar blizny pooperacyjnej do dawki 60 Gy/g. Obserwowano reakcję popromienną skóry - EORTC II



PMRT a zabiegi rekonstrukcyjne

Powikłania występują niezależnie od techniki rekonstrukcji i sekwencji w stosunku do radioterapii/ chemioterapii.

Nie ma odrębnych wskazań do radioterapii dla chorych po IBR (Immediate Breast Reconstruction)

Take home.....

- ☐- PMRT zmniejsza ryzyko wznowy i przedłuża przeżycie i powinna być stosowana we wskazaniach niezależnie od typu rekonstrukcji piersi.
- ☐- tkanki użyte do rekonstrukcji mogą wpływać na proces planowania rozkładu dawki w radioterapii, ale nie mają wpływu na dawki , frakcjonowania i obszary napromieniane.
- ☐- „no level I” EBM co do optymalnego czasu i sekwencji PMRT i zabiegów rekonstrukcyjnych.
- ☐- przewaga autologicznych zabiegów rekonstrukcyjnych w zakresie częstości powikłań i efektu kosmetycznego,
- ☐ zabiegi z użyciem implantów możliwe ale ze świadomością gorszych efektów kosmetycznych i funkcjonalnych
- ☐- konieczność szerokiej informacji o wadach i zaletach typów zabiegów rekonstrukcyjnych w aspekcie wskazań do PMRT.
- ☐- decyzje w wielodyscyplinarnym zespole.....



Dziękuję za uwagę.....