Applying plastic surgery principles to ovarian tissue transplantation

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Background

Increasing long-term survivorship after cancer highlights the fact that the effects of gonadotoxic treatment are becoming increasingly important (1). Ovarian tissue cryopreservation and transplantation enables the preservation of many thousands of primordial follicles without ovarian stimulation. Depending on the location of the grafting site, the process may allow for spontaneous pregnancy in the future with a success rate of about 30%. (2)

Plastic surgery techniques have previously been applied in gynaecological procedures, including vulval surgery, congenital vaginal agenesis and fistula repairs (3). The aim of this article is to explore the opportunity for plastic surgery principles, in particular those relating to tissue grafting, to be applied to OTT.

Methods

An electronic literature review was conducted using the PubMed, Cochrane, SCOPUS and Medline databases for publications dated from 1988-2018 for all relevant full text articles published in English, to evaluate surgical techniques for ovarian tissue autotransplantation. Articles abstracts and/or full article details were then reviewed by two reviewers in order to determine article suitability. Two reviewers independently reviewed the included reports. Data from the text, graphs, and tables were qualitatively analysed.

Discussion

While graft take is multifactorial, several strategies have been described to improve the quality of grafted ovarian tissue and the clinical outcomes of OTT. As in skin grafting, there needs to be good quality and quantity of ovarian tissue harvest, an appropriate recipient site with a well vascularized graft bed, strong graft fixation technique to prevent shearing of neovasculature and optimization of comorbidities such as diabetes or immunosuppression. We believe that ongoing discussion between disciplines can have the potential to improve knowledge, surgical techniques and patient outcomes.

Comparison of skin grafting and ovarian tissue grafting factors

	Skin Grafting	Ovarian Tissue Grafting
Thickness	Split skin graft: 0.2-0.4mm Full thickness skin graft: 2-4mm	1-2mm thickness
Operative approach	Open/Direct	Laparoscopic Open/Direct
Harvest technique	Blade (either manual or mechanical)	Scissors or scalpel Total oopherectomy (scissors, ligation, diathermy)
Quantity of tissue	Based on size of recipient area	Partial - up to 50% of cortex Total
Preparation of graft	Can be fenestrated or meshed to increase surface to volume ratio	Can transplant multiple small slices/pieces of ovarian tissue to increase surface to volume ratio (size of each piece variable)
Graft preparation technique	Mechanical mesher Blade fenestration	Scalpel Scissor Slicer
Recipient site selection	Donor site of graft typically chosen based on recipient site (e.g. similar skin type especially for full thickness skin grafts, in terms of colour, quality, thickness)	Orthotopic (ovary or intraperitoneal, subperitoneal), Heterotopic – eg. abdominal wall, especially if pelvis unsuitable (limbs, abdominal wall, back, breast)
Characteristics of recipient site	Well vascularized Low shearing force	Well vascularized Low shearing force Proximity to ovary (to achieve natural pregnancy)
Preparation of recipient site	Improve vascularity (negative pressure dressings, importation of vascularity – prefabrication) Single or staged procedures	Single or staged procedures
Fixation techniques	Sutures Glue Staples	Sutures Glue Staples
Patient factors	Systemic disease e.g. diabetes Locoregional factors e.g. radiotherapy Skin quality	Systemic disease e.g. diabetes Locoregional factors e.g. radiotherapy Skin quality

References

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