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Review

Incidence, risk factors and treatment of cervical stenosis after radical trachelectomy: A systematic review

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Abstract ***Purpose:*** Cervical stenosis is a major and specific postoperative complication following radical trachelectomy. The current article presents a review of studies describing the incidence, risk factors and treatment methods of cervical stenosis after this fertility sparing procedure.
Methods: We searched PubMed, MEDLINE, Embase (January 1994 through November 2014) using the following terms: uterine cervix neoplasms, cervical cancer, radical trachelectomy, fertility sparing and fertility preservation. We included original articles and case series. Case reports, review articles, articles not in English and articles not mentioning cervical stenosis were all excluded.
Results: We identified 1547 patients. The incidence rates of cervical stenosis ranged from 0% to 73.3% with an average rate of 10.5%. Among patients with abdominal, vaginal, laparoscopic and robotic radical trachelectomy, the incidences of cervical stenosis were 11.0%, 8.1%, 9.3% and 0%, respectively. In patients in whom whether cerclage was placed or not, the incidence rates of cervical stenosis were 8.6% and 3.0%, respectively ($P = \text{NS}$). Among those in whom whether anti-stenosis tools were placed or not, the incidences of cervical stenosis were 4.6% and 12.7%, respectively ($P < 0.001$). Cervical stenosis was a potential cause of infertility and increased the use of artificial reproductive technology. Surgical dilatation resolved stenosis in the majority of cases but had to be repeated.
Conclusions: Cervical stenosis is related to the surgical approach, cerclage and anti-stenosis tools utilised. It affects not only the quality of life but also obstetrical outcomes of patients following radical trachelectomy. Greater attention should be given to the prevention and treatment of this complication.

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1. Introduction

Since the effective and widespread use of cervical screening programmes, cervical cancer is more frequently diagnosed at a younger age in women who wish to retain their fertility. These factors pose new challenges in the management of this disease [1,2].

Fertility preservation via the use of vaginal radical trachelectomy (VRT) in patients with early stage cervical carcinoma was first described by Dargent in 1994 [3]. The technique involves the removal of the cervix with the contiguous parametria and the upper vaginal cuff while preserving the uterus corpus and adnexae. In combination with laparoscopic pelvic lymphadenectomy, this procedure has been shown to be an effective treatment for early stage cervical cancer [4]. Abdominal radical trachelectomy (ART), in a similar manner to type C/Piver III radical abdominal hysterectomy, was published in 1997 by Smith [5]. Compared to VRT, ART produces better oncological outcomes, has a shorter learning curve and can technically be performed by any trained gynaecologic oncologists. However, fertility outcomes of ART were unfavourable compared with VRT [6]. In 2003, Lee [7] introduced the first laparoscopic radical trachelectomy (LRT). Persson [8] subsequently reported on the first robotic radical trachelectomy (RRT) in 2008. All of these techniques have provided a greater number of alternatives for young women with early-stage cervical cancer.

Recently, radical trachelectomy (RT) has been advocated as feasible and safe for patients with early stage cervical cancer. However, some postoperative complications such as cervical stenosis severely affect the patients' quality of life and worsen obstetrical outcomes after this fertility sparing procedure. This article reviews the literature regarding cervical stenosis after radical trachelectomy in early stage cervical cancer with the following goals: (1) summarise the manifestations and morbidities of cervical stenosis that occur following the fertility sparing option; (2) assess the risk factors for cervical stenosis and (3) explore effective prevention and treatment options for reducing this complication.

2. Methods

A literature search of PubMed, MEDLINE and Embase (from January 1994 through November 2014) was performed using the following key words: "uterine cervix neoplasms", "cervical cancer", "radical trachelectomy", "fertility sparing" and "fertility preservation". Reference lists of all articles identified by our searches were reviewed. The inclusion criteria were as follows: (1) original articles and case series published in English and (2) articles including information about cervical stenosis, tumour size, follow-up period, surgical details and/or obstetrical outcomes. Case reports and review articles were excluded.

3. Results

A total of 32 articles met the inclusion criteria. Demographic and tumour information, surgery details and the incidence rates of cervical stenosis are summarised in Table 1.

3.1. Clinical manifestations and morbidities

Cervical stenosis can be asymptomatic, but it can also lead to menstruation problems, such as regular but decreased menstrual flow, prolonged or irregular menses, newly developed dysmenorrhoea or amenorrhoea. Additionally, impediment of menstrual flow can cause accumulative or retrograde menstruation. On transvaginal ultrasonography, haematometra might be observed [9–12]. More seriously, secondary endometriosis might be developed [13,14]. Cervical stenosis is a potential cause of dyspareunia that might lead to anxiety and also create subfertility [15].

One hundred and sixty-two of the 1547 (10.5%) patients who underwent radical trachelectomy had cervical stenosis. Among these who had ART, VRT, LRT and RRT, the incidence rates of cervical stenosis were 11.0% (47/429), 8.1% (67/831), 9.3% (14/150) and 0% (0/20), respectively (P = NS).

3.2. Cerclage

One thousand three hundred sixty-two of the 1517 (89.8%) patients who completed radical trachelectomy had a cerclage placed. Among those with cerclage placement, the incidence of cervical stenosis was 8.6% (104/1215). Among the patients who did not have a cerclage placed, the incidence rate was 3.0% (2/66) (P = NS). Some authors hold the opinion that cerclage can increase erosion, infection and induce cervical stenosis [16–18]. Additionally, the technique used for cerclage placement, particularly if the stitch is placed too deeply into the cervical stroma, might increase the occurrence of cervical stenosis [13].

The types of suture materials used in the cerclages were Prolene (n = 194), nylon (n = 188), Mersilene (n = 132), Ethibond (n = 99), silk (n = 32), Tetron (n = 2) and Gore-Tex (a few). Approximately 59.0% (382/647) of the sutures were non-absorbable and non-braided materials, including the Prolene, nylon and Gore-Tex sutures. The others, including Mersilene, Ethibond, silk and Tetron, were non-absorbable and braided materials. The occurrence rates of cervical stenosis were 10.7% and 8.1% in the non-braided and braided groups, respectively (P = NS). Specifically, these rates were 10.4% (20/193),