CURRENT SURGICAL STRATEGIES IN OVARIAN CARCINOMA — A REVIEW

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SYNOPSIS

Ovarian carcinoma is a leading cause of deaths from gynaecologic malignancies both in the West and locally in Singapore. Most cases are found in an advanced stage with widespread intraperitoneal disease and hence survival rates are expectedly low giving ovarian cancer the notoriety of a higher fatality rate than any other gynaecologic cancer.

In the last decade, sites of occult intra- and retroperitoneal spread in early disease apparently confined to the pelvis have been found and the reasons for the approximately one third of patients who fail with Stage I disease (after apparently curative surgical resection) are now better understood. The definition of what currently constitutes an adequate staging laparotomy for explorations in ovarian cancer will be discussed.

Surgery forms a cornerstone of therapy in all stages of disease in addition to its diagnostic role. A variety of surgical strategies have evolved for surgical therapy of ovarian cancer from initial staging exploratory laparotomy, unilateral adnexal removal, hysterectomy with bilateral ovarian extirpation to 'maximal effort' surgical resection in advanced bulky resectable disease. Optimal resection with minimal residual disease in combination with effective adjuvant chemotherapy has produced a steadily increasing median duration of survival and a slowly increasing number of cured patients. Second look operations and second explorations as well as palliative surgical procedures all have a part in the repertoire of surgical strategies necessary to adequately manage this disease.

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INTRODUCTION

Ovarian carcinoma is a leading cause of death from gynaecologic cancer in Scandinavia, the United States, England and Wales, as well locally in Singapore. Annually, in the USA, there are 11,500 deaths (1) and in England and Wales approximately 3,500 (2) from ovarian cancer. In Singapore, the incidence is much lower than in many western countries and is 6 per 100,000 per year compared to the United States' rate of 12.5 and the United Kingdom's of 11.3 (3). The incidence in Singapore is intermediate between that of western countries and that of Japan's which is 2.8 per 100,000 (3). It is significant that locally, ovarian cancer at 9.6% ranks as the fourth most frequent cancer in the 15–34 years age group though overall in Singaporean females it is the eighth most frequent cancer (3). In Singapore, it is the second most common cause of death from gynecologic malignancies after cervical cancer (4).

Unexpectedly among Malays in Singapore, of the common cancers ovarian seems to be the only malignancy which occurs much more frequently then in the other races with a crude incidence rate of 5 per 100,000 per year compared to that in Chinese and Indians of 4.8 and 2.5 respectively (3). Internationally more than 50 per cent of cases are in FIGO Stage III or IV at initial presentation with dismall 5 year survival rates of only 13.5 and 4.5 per cent respectively (5).

However, even FIGO Stage I and II (Table I) ovarian carcinoma has a combined survival of only 55% being made of 50–70% for Stage I and 45% for Stage II in spite of apparently curative surgery (6). The reasons for these rather low cure rates by total excision of visible pelvic disease were not known till the 1970's when a number of sites within the peritoneal cavity and retroperitoneally were recognized to often harbour either microscopic disease or unrecognized metastases from tumours otherwise apparently confined to the ovaries or the pelvis. It is therefore currently considered essential that a proper surgical staging technique be used to routinely evaluate these intra- and retroperitoneal locations to accurately document the disease status especially if in the pelvis it appears to be early.

Of all the prognostic factors identified in the last decade in patients with ovarian cancers, it is now well established that one of the most important determining response and duration of survival following use of adjuvant therapies is the volume of residual disease following surgical resection (7). It is therefore the purpose of this brief review to outline the current surgical strategies utilized for diagnosis and therapy in ovarian cancer and discuss their rationale since staging is surgical unlike in other gynaecologic cancers and surgery forms the cornerstone of therapy in all stages of ovarian cancer and is essential for creating an optimal situation for adjuvant therapies to produce the best results. Of necessity any discussion of ovarian cancer therapy must be preceeded by a consideration of epidemiologic and prognostic factors.

EPIDEMIOLOGY

Epithelial ovarian cancer occurs most commonly between the ages of 40–69 and has a peak incidence at 55 years (8). Over the last decade, of epidemiological factors recognized to be important (6) is racial origin with a very much higher incidence in white caucasian women than USA blacks and orientals. A familial incidence is now well recognised and an association noted with low parity, menstrual disturbances, breast and colon cancer, use of talc on external genitalia and past mumps infection. A preventive effect is noted from the use of oral contraceptives as well as from pregnancies — the effect of the first being most markedly protective (9).

TABLE 1
STAGE DEFINITION IN PRIMARY CARCINOMA OF OVARY ACCORDING TO THE INTERNATIONAL FEDERATION OF GYNECOLOGY AND OBSTETRICS (FIGO)

Stage I	Growth limited to the ovaries
Stage Ia	Growth limited to the ovary (i) No tumour on the external surface; capsule intact (ii) Tumour present on the external surface, and/or capsule ruptured
Stage Ib	Growth limited to both ovaries; no ascites (i) No tumour on the external surface; capsules intact (ii) Tumour present on the external surface, and/or capsule ruptured
Stage Ic	Tumour at either Stage Ia or Ib, but with obvious ascites* present or positive peritoneal washings
Stage II	Growth involving one or both ovaries with pelvic extension
Stage IIa†	Extension and/or metastases to the uterus and/or fallopian tubes
Stage IIB	Extension to other pelvis tissues
State IIc	Tumour at either Stage IIa or Stage IIb, but with obvious ascites or positive peritoneal washings
Stage III	Growth involving one or both ovaries with intraperitoneal metastases outside the pelvis, and/or positive retroperitoneal nodes Tumour limited to the true pelvis, with histologically confirmed malignant extension to small bowel or omentum
Stage IV	Growth involving one or both ovaries, with distant metastases or Pleural effusion is present, with positive cytology or Metastasis to liver parenchyma

* Ascites is peritoneal effusion that the surgeon considers pathological or clearly exceeding normal amounts, or both.

† Patients with endometrial carcinomas of the ovary and independent primary cancers of the endometrium are placed in this group.

PROGNOSTIC FACTORS

Though generally advancing FIGO stage of disease (Table I) is inversely correlated with survival rate, stage IIA disease may be associated with better survival than stage IC (5). This can be understood as the former can be encompassed by a curative surgical resection whereas in the latter, transcoelomic spread of malignant cells through ascites or in peritoneal washings places the disease beyond the limits of curative surgical resection. Histologic grade is an important factor influencing survival, with much better survival in those described as being of low malignant potential (borderline malignancy) (5) or in well differentiated categories than in poorly differentiated tumours.

A. Occult spread in early ovarian cancer

Involvement of the subdiaphragmatic area particularly the right hemidiaphragm is now recognised as an early and common site of spread of what had in the past appeared to be cancer confined to the ovaries and the pelvis.

TABLE 2
OCCULT SITES OF METASTASES IN STAGE I AND II OVARIAN CANCER

SITE	STAGE I (%)	STAGE II (%)
Diaphragm	11.3	23.0
Omentum	3.2	7
Para-aortic nodes	13.3	10
Pelvic nodes	8.1	– (10)*
Malignant Peritoneal Cytology	33.0	12.5

Reproduced from Piver 1984 (Ref 13)
* Chen 1984 (Ref 32)

The subdiaphragmatic area is involved in up to 16% of cases of otherwise apparently Stage I or Stage II ovarian cancer (8). The paraaortic nodes are involved in up to 12% of Stage I cases (11) and in up to 15% of Stage II cases (12) but only slightly lower rates of 8 to 9% of pelvic lymph node involvement occur. Lymphangiography is not accepted as a technique for staging by FIGO because of problems of interpretation and accuracy but instead the nodes have to be surgically excised and documented histopathologically before the information is used for staging categorization. Malignant peritoneal cytology which occurs in up to 30% of patients with Stage I (10) and 12.5% of Stage II cancer (13), is of prognostic importance and an indicator that adjuvant therapy either systemic or to the whole peritoneal cavity is necessary in addition to pelvic surgery for cure. The omentum is not an uncommon site of occult tumour spread and is involved in up to 7% of patients with otherwise Stage I or II ovarian cancer (12) and should therefore be subjected to generous biopsy or excision of its infra-colic portion.

B. Residual tumour volume

The amount of residual tumour after surgical resection is a most potent prognostic factor and Griffiths (14) has shown by multiple regression and multivariate analysis that the histologic grade and size of residual tumour nodules post-surgically are both significantly related to survival and these findings have been confirmed by Greco (15) and Wharton and Herson (16). More significantly, Griffiths (14) showed an improved survival in patients with small residual metastatic disease of less than 1.6 cm diameter; this improved survival was found in both groups, those in whom disease had been debulked from initial large tumour burden to 1.6 cm or less and in those with initial tumour masses of less than 1.6 cm diameter. These data support the value of debulking surgery which reduces tumour to an optimal volume rather than the initial tumour volume as the factor influencing survival.

C. Histologic grade

Histologically, tumours of low malignant potential (borderline malignancy) are now a well defined and identifiable group (17) and these are associated with a much higher survival rate (18) partly because more such borderline tumours are found in a lower stage of disease and more often in younger women. However, even when borderline tumours are not included in analysis a lower grade of tumour is associated with better survival (5).

Other factors of prognostic importance associated with an increased duration of survival are younger age of patients and a longer progression-free interval prior to institution of adjuvant therapy.

INDICATIONS FOR EXPLORATION

Irrespective of age any woman with an adnexal mass even if it is cystic should be explored when it enlarges beyond 5 cm except in patients in the younger reproductive age group or in those less than 40 years, when it may be observed for regression over 1 or 2 menstrual cycles as may occur in functional ovarian cysts (19). Any symptomatic ovarian tumour/mass irrespective of size however should be explored and exploration is mandatory when any mass exceeds 10 cm in size. Any palpable adnexal or ovarian masses in the premenarchal, peri- and post-menopausal age groups merit prompt exploration (20) to ascertain their nature unless one is certain that these are not of ovarian origin. Whereas ovaries may be palpable during the reproductive years, the palpable post-menopausal ovary (PMPO) is regarded as abnormal and an indication for exploration since 10% harbour an ovarian neoplasm (21). Bilateral ovarian masses accompanied by nodularity, induration and nodules in the rectovaginal pouch even though asymptomatic should be considered an indication to explore the patient (19), especially when endometriosis has not been definitely proven or is clinically an unlikely diagnosis. Clinically however, the most common indications for exploration are either enlarged asymptomatic ovarian mass(es) or pelvi-abdominal mass(es) accompanied by abdominal pain, abdominal distension or ascites.

Surgical exploration of the abdomen is an extremely costly procedure both in terms of financial cost and possible morbidity to the patient. It should therefore always be performed in a meticulous manner using a technique which ensures that the entire abdomen is fully evaluated and if ovarian cancer found, it is adequately and definitively staged. However inadequate explorations are relatively common enough so that 30 per cent of patients following initial exploration when considered for adjunctive therapy and re-explored are upstaged at the repeat procedure (22).

ADEQUATE STAGING LAPAROTOMY AND SURGICAL THERAPY IN EARLY OVARIAN CARCINOMA

A Pfannenstiel/low transverse incision should not be employed whenever an exploration is done for evaluation of an ovarian or adnexal mass (22) but instead

a vertical midline or paramedian incision used irrespective of the patient's age if the possibility of ovarian cancer exists. It is impossible to adequately evaluate and assess the upper abdomen in the subdiaphragmatic area and perform the necessary omentectomy or paraaortic node sampling through low transverse incisions.

Immediately upon opening the peritoneal cavity any ascitic fluid is aspirated or if none is present peritoneal washings are obtained (Table 3). An ovarian tumour should always be considered to be a possible secondary tumour from a primary lesion in one of the intraabdominal organs. The most common organs giving rise to ovarian secondaries are the stomach and the large bowel, however other possible primary sites may be the liver, gall-bladder and the pancreas. It is therefore essential to evaluate all these organs during an exploratory laparotomy for an ovarian tumour both to exclude a possible site of primary origin or metastatic involvement from a primary ovarian cancer.

The surgeon should always resist the temptation to begin a pelvic dissection before thoroughly evaluating the rest of the abdomen for the pelvic findings may modify ones surgical approach and temper ones attempts to radically excise pelvic disease if bulky disease in the upper abdomen is non-resectable. Any adhesions, deposits, suspicious peritoneal implants or nodules must be sampled or excised for histologic evaluation as histology often surprisingly reveals that some are of inflammatory or benign nature rather than the presumed malignant implants and vice-versa. The subdiaphragmatic peritoneal surfaces should be thoroughly evaluated both by palpation and then inspection aided with a laparoscopic fibre-optic light cable. Any suspicious nodules are biopsied, when no macroscopic involvement is noted a cytologic scrape or a random biopsy may be obtained.

The paraaortic nodes must be palpated in addition to the pelvic nodes and both these groups of nodes when enlarged must be excised for histologic evaluation whenever the ovarian cancer is otherwise thought to be either in FIGO Stage I or II. The routine sampling of non-palpable pelvic and paraaortic nodes in otherwise Stage I or II disease cannot at present be recommended in all cases but may be preferred since in about 10% of patients in whom disease had otherwise been thought to be confined to the ovaries, the paraaortic nodes were involved (10). The pelvic and paraaortic regions should however at least be inspected by exposing the pelvic and abdominal vessels to ensure that no enlarged nodes are missed. However, enlarged or visible nodes should always be excised in these categories (Stage I and II) to document involvement for staging purposes.

Tumours up to Stage IIA, can be encompassed by a surgical resection which includes a total hysterectomy and bilateral salpingo-oophorectomy (THBSO) and this may be curative (except in the presence of ascites or when peritoneal cytology is positive, ie., FIGO Stage IC). Hence, a total hysterectomy with bilateral salpingo-oophorectomy and a thorough staging laparotomy is adequate surgical therapy in Stage I and IIA ovarian cancer. In Stage IIB ovarian cancer any pelvic peritoneal implant on the uterovesical or rectovaginal peritoneum should be excised and any superficial implants on the pelvic sigmoid colon or upper rectum also extirpated to ensure removal of all macroscopic disease. Rectosigmoid resections or partial bladder excisions are best avoided unless by removing these portions all visible disease is extirpated and primary repair possible and no disease has been found in the rest of the abdomen by thorough staging laparotomy.

CONSERVATIVE SURGERY IN UNILATERALLY CONFINED EPITHELIAL OVARIAN CARCINOMA

There are certain guidelines (Table 4) for removal of only the involved ovary leaving the opposite ovary and uterus in situ in the case of an unilateral ovarian tumour (19). The patient should be a young woman with both a desire and a potential for childbearing. The tumour should be unilateral, completely encapsulated by a capsule intact in all parts, non-adherent and histopathology should either be of well-differentiated type or

TABLE 3
SURGICAL MANAGEMENT OF OVARIAN CARCINOMA

REQUISITES FOR AN ADEQUATE EXPLORATION FOR EARLY OVARIAN CANCER

1. A midline/paramedian incision from symphysis pubis to well above the umbilicus.
2. Aspirate any free fluid, ascites — measure volume, note character and send for cytology. If no fluid, obtain washings with 300 mls of warm normal saline irrigating all recesses of the peritoneal cavity especially the pelvis, paracolic gutters, subdiaphgramatic areas and over the surface of bowels (add heparin/sodium citrate to preserve for cytologic evaluation). Send aliquot or sediment for cytology.
3. Evaluate the entire abdomen and its organs to rule out a primary lesion from the stomach, small and large bowel, liver, gall-bladder, pancreas and the appendix.
4. Evaluate the ovarian mass(es) for site of origin, size, site of adherence, sites of rupture and penetration of tumour through the capsule. Evaluate tubal involvement.
5. Inspect all peritoneal surfaces including the subdiaphragm (using fibre-optic cable) and bowel serosa. Biopsy any suspicious nodules for histology or obtain a random peritoneal biopsy or cytologic scrape from sub-diaphragm and paracolic gutters.
6. Inspect and palpate the entire omentum (greater and lesser) for metastatic tumour nodules and either obtain a generous biopsy in Stage I or II disease or perform an infracolic omentectomy as a diagnostic procedure.
7. Palpate the pelvic and paraaortic nodes and in apparent Stage I or II disease, excise the enlarged nodes and preferably *routinely sample* any visible paraaortic and pelvic nodes (external, internal, common iliac and obturator).
8. Mark all sites of residual disease and record the volume of the largest residual nodule. Maintain a detailed record of all relevant findings and details of procedures performed as well as all sites of residual disease at completion of procedure. A FIGO stage is assigned after pathologic evaluation of all specimens.

of low malignant potential (borderline malignancy). An extensive and exhaustive exploration should have excluded any spread of tumour beyond the ovary and a staging laparotomy as described above should have been done. The ovary that is to be preserved should be subjected to meticulous examination and if there are any suspect areas at all, these should be excised for biopsy; alternatively some would advocate that a wedge biopsy be obtained from the retained ovary. This may be appropriate especially in serous (and dysgerminomatous) tumours which have a higher incidence of bilaterality and subsequent recurrence (18). In young patients whenever there is uncertainty as to whether the opposite uninvolved ovary and uterus should be extirpated and frozen section facilities unavailable, it is advisable that a conservative operation be performed until all histopathologic information becomes available and if further surgery indicated it may be done at a later time. Whenever the uterus is retained, it is preferable to perform an endometrial curettage to exclude a primary tumour from the endometrium in cases of endometrioid or serous papillary carcinoma.

DEBULKING SURGERY IN ADVANCED OVARIAN CARCINOMA

A. Transperitoneal resections

Unfortunately ovarian cancers are often not found in early surgically curable stage of disease but in excess of one third are in advanced stage (Stage III) at presentation. Not only is Stage III extent the commonest stage at presentation but surgically it is the most challenging and demanding of surgical skills and fine clinical judgement for adequate surgical therapy. Surgical debulking is the cornerstone of therapy in advanced ovarian cancer since optimal resection is significantly correlated with an increased duration of survival and symptom-free as well as progression-free intervals when residual tumour volume is reduced to a small a volume as possible. Surgical debulking can often achieve up to 99 per cent reduction of tumour volume at one undertaking far exceeding anything that can be expected of either chemotherapy or radiotherapy. Most importantly, the likelihood of achieving a complete remission to subsequent adjunctive therapeutic modalities of either chemotherapy or radiotherapy is entirely dependent on an optimal residual tumour size which should be less than 1.6 cms (14) or preferably as small as possible or even better if no visible disease remains (15). Moreover, increasing tumour masses interfere both metabolically through depletion of protein reserves by ascites production, its sequestration or loss through paracentesis and also interfere mechanically with bowel function through subacute obstructions. Smaller tumour masses are more sensitive to chemo- or radiotherapy because of better vascularity, oxygenation and their higher growth fraction.

Debulking surgery performed by adequately experienced gynaecologic surgeons is well tolerated and not accompanied by significant or prohibitive morbidity (24) which has deterred such surgical maneuvers by gynaecologists in the past. Debulking surgery with maximal surgical effort (25) refers to an extensive surgical procedure which includes removal of densely adherent uterus and ovaries, removal of all involved pelvic peritoneum and any non vital organs (appendix, spleen) with tumour implants or resection of parts of the bowel and occasionally even of the urinary tract including partial cystectomy and ureteral resection. Such resections may be undertaken if they would result in *extirpation of all macroscopic disease and if the continuity of the bowel and urinary tract can be re-established.* Otherwise, such resections are best avoided at time of primary exploration as there is yet no certainty and certainly less likelihood of inducing a complete remission with adjunctive chemotherapy when there is macroscopic residual disease.

B. Retro-or extraperitoneal resections for extensive pelvic spread

Occasionally, in the presence of very advanced pelvic spread of tumour, it appears that any surgical attempt at resection would be extremely hazardous if not impossible. An alternative approach that could be utilized instead of attempting a routine transperitoneal THBSO in such difficult circumstances is an extraperitoneal technique of resection (25). The dissection is begun above the pelvic brim and the peritoneum on either side is incised lateral to the infundibulopelvic ligaments. The ovarian vessels are then identified on the medial peritoneal leaves and the ureters identified and preserved. Early ligation of the infundibulopelvic ligaments with the contained vessels results in a minimal blood loss following any further pelvic dissection. With visualization of both ureters it is possible to proceed with a safe and bloodless dissection in an extraperitoneal plane by creating the avascular para-

TABLE 4
SURGICAL MANAGEMENT OF OVARIAN CANCER

GUIDELINES FOR UNILATERAL SALPINGO-OOPHORECTOMY IN OVARIAN CANCER

1. Patient is of young age with a desire and capacity for child-bearing.
2. Tumour staged by a meticulous and thorough staging laparotomy and found to be Stage IA(i).
   a. Tumour is completely encapsulated, free of adhesions and removed intact without any spill.
   b. Peritoneal washings contain no malignant cells.
   c. An omental biopsy or omentectomy is free of any tumour involvement.
   d. The subdiaphragmatic areas, the pelvic and paraaortic nodes are evaluated and free of "occult" spread.
3. Histologic grade of epithelial cancer must either be grade I (well differentiated) or borderline malignancy (low malignant potential) or it must be a germ cell tumour or sex cord-stromal tumour.
4. There must be no microscopic evidence of invasion of the capsule, blood vessels and mesovarium.
5. The opposite ovary should have been subjected to thorough evaluation and preferably to a wedge biopsy and no microscopic tumour found.

rectal spaces bilaterally and proceeding towards the inferior part of the pelvis and pelvic floor. The ureters may be dissected off the pelvic peritoneum (medial leaves of broad ligament) whilst ensuring preservation of their blood supply and integrity and any involved peritoneum of the recto-uterine pouch thereby excised with safety. Since the large vessels of the pelvis are easily identified, the origin of the uterine arteries may be easily identified and these vessels ligated at their origin under direct vision further avoiding any blood loss. Following incision of the uterovesical fold of peritoneum and mobilisation of the bladder from the cervix, hysterectomy may be performed in a retrograde manner but with a much wider removal of pelvic peritoneum involved by tumour implants.

It is seldom however that one uses the retroperitoneal approach to remove both the uterus, cervix and ovaries as well as perform a segmental excision of the recto-sigmoid, though this has been advocated in tumours apparently confined to the pelvis with involvement of the recto-sigmoid if bowel continuity can be reestablished by primary end to end anastomosis (26). However such a radical approach is rarely indicated as a primary procedure in epithelial ovarian cancer as often the tumour which has extensively involved the pelvis often has evidence of spread to the general peritoneal cavity and therefore such resections should only be done if the maneuver would result in the absence of any macroscopic residual disease. Chemotherapy would of course still be needed to eradicate any microscopic or occult residual disease. There is little place therefore for considering any form of pelvic exenterative surgery when it is understood that the natural history of ovarian cancer is such that even in apparently localized pelvic disease, the whole peritoneal cavity is at risk for development of recurrent tumour.

SECOND LOOK PROCEDURES & RE-EXPLORATIONS

A second look procedure is appropriate in the case when the patient has had an adequate initial surgical procedure followed by a course of adjunctive chemotherapy. The second look procedure should be considered only for those patients in whom persistent disease cannot be confirmed on clinical examination and by appropriate diagnostic procedures such as fine needle aspiration or needle (eg., Tru-cut®) biopsy procedures. Currently, scanning by ultrasound or computed tomography alone is not sufficiently specific to completely exclude the presence of residual disease (27). It is because a real risk of inducing leukemia with cytotoxic drugs exists and the bone marrow supressive effects of most drugs that cytotoxic therapy should not be continued indefinitely but rather given for a planned course of treatment and discontinued as soon as it can be determined that there is no longer any residual disease present. Currently there is no non-invasive diagnostic test which is sufficiently sensitive and specific to exclude the presence of microscopic residual disease. Ideally, the proof of disease eradication in epithelial ovarian cancer must be by histologic means and hence the need for a second look procedure is today widely recognized as necessary to document complete pathological remission before therapy is terminated or change in treatment made if persistent disease found.

An adequate second look procedure (Table 5) like the initial evaluation must be performed using a meticulous surgical technique in a thorough and systematic manner and is not a simple laparotomy (28). The second look procedure should ideally be a formal laparotomy. It may be preceded by laparoscopy and if no disease is found then a full laparotomy is mandatory to exclude residual disease (29). However, if laparoscopy shows the presence of metastatic tumour implants over the parietal peritoneum or significant amount of ascites than the fluid should be aspirated and the tumour implants biopsied to confirm cytologically or histologically the presence of tumour. If tumour cannot be confirmed by these procedures then a thorough second look laparotomy as described below is indicated. A re-exploration laparotomy would still be considered appropriate if at laparoscopy recurrent tumour that can be totally excised is found and further option of adjunctive therapy is available.

TABLE 5
SURGICAL MANAGEMENT OF OVARIAN CANCER

REQUISITES FOR AN ADEQUATE SECOND-LOOK PROCEDURE IN OVARIAN CANCER

1. An adequate midline/paramedian incision from public symphysis to well above umbilicus.
2. Aspirate any free fluid or ascites to send for cytology and cell block analysis. If no fluid/ascites obtain peritoneal washings with normal saline.
3. Evaluate by inspection and palpation the entire peritoneal cavity, the intra-abdominal organs, (liver, gall bladder, pancreas, stomach and spleen) including the serosa of the small and large bowel as well as the mesentery and mesocolon. Any suspect areas are biopsied.
4. Particular attention to all sites of previous residual disease and preferably obtain peritoneal biopsies. Biopsy of stumps of infundibulo-pelvic and round ligaments and the peritoneum of the uterovesical and rectovaginal pouches as well as lateral pelvic wall peritoneum.
5. A cytologic scrape from the subdiaphragmatic area or alternatively a random biopsy as well biopsy of the peritoneum of lateral paracolic gutters bilaterally.
6. Examine and biopsy all adhesions or scarred areas for histology as well excise as any omental remnant.
7. In absence of any intraperitoneal disease — obtain samples of both the pelvic and paraaortic nodes.
8. Remove the previously preserved ovary and uterus unless in exceptional circumstances fertility considerations are paramount and histology showed germ cell tumour or sex cord stromal tumour in young women.

Technique of Second look laparotomy

An adequate midline or paramedian incision is made. Upon entry into the abdomen, any fluid present is aspirated for cytology. In the absence of any ascites or free fluid approximately 300 mls of warm normal saline are instilled into the abdomen ensuring that it flows into all the peritoneal recesses of the pelvis, paracolic gutters, the subdiaphragmatic areas, subhepatic spaces and this volume is aspirated and after allowing it to sediment or following centrifugation an aliquot send for cytologic evaluation. The entire peritoneal cavity is then systematically inspected and palpated and any suspicious implant, nodule or scarred area is biopsed for histologic evaluation. The

sites of residual disease at the previous exploration must be meticulously evaluated and routinely biopsed. Since the pelvic peritoneum is the most frequent site for persistent cancer, particular sites for biopsies are the stumps of the infundibulo-pelvic and round ligaments, the peritoneum covering the bladder and the pouch of Douglas and the lateral pelvic wall peritoneum. Any suspect areas of serosa on the small and large bowel as well as on the mesentry and mesocolon are biopsed. The peritoneum of the paracolic gutters at the most dependent locations and the peritoneum of the subdiaphragmatic areas should be inspected as well as palpated and either a scrape for cytology taken or random peritoneal biopsies obtained. All adhesions either in the pelvis or between bowel segments in the peritoneal cavity must be excised for histology for it is often in these sites that residual tumour is most commonly found. Any omental remnant must be excised for histology. In the absence of any gross disease only an infracolic omentectomy is performed. To assess the retroperitoneal area, the paraaortic nodes and the pelvic nodes from the lymph node chains along the anterior aspect of the common, external and internal iliac as well as the obturator vessels are exposed for inspection. Any visible or enlarged lymph nodes or retroperitoneal nodules in these locations must be excised for histologic evaluation, alternatively, random samples of any nodes may be obtained. If at the previous operation, one ovary has been retained or the uterus left in-situ, then these structures should be extirpated at the second look procedure in the case of epithelial cancers. However in young women with tumour marker producing germ cell tumous in whom appropriate chemotherapy is often highly effective and curative and fertility needs to be preserved this is often unnecessary.

Second look procedures when negative are currently the best prognosticators of prolonged survival (30) and allow chemotherapy or other adjunctive therapy to be discontinued with a good degree of confidence. However in up to 17% patients, recurrent disease may still occur inspite of a negative second look (31) but obviously the likelihood of this occurrence happening varies inversely with the exhaustiveness of the exploration and the care taken to exclude disease at the second look procedure.

PALLIATIVE OPERATIONS AND SECOND EXPLORATIONS

These operations require a thorough understanding of the natural history of ovarian cancer, sufficiently wide experience of the disease, with an appreciation of the phase of the disease at which the patient is currently at, combined with a nicely balanced judgement of the appropriateness of further intervention. Also consideration of the patient's status, her current level of comfort, performance and ability to function at home and likelihood of obtaining another period of useful life need to be taken into account. Assessment must also include the usefulness or applicability of any further adjunctive therapeutic modalities for dealing with residual disease following the second resection.

Pelvic exenterations however have little or no place in the surgical management of ovarian epithelial cancers either as primary or especially secondary procedures. However gastrostomies, internal bowel bypass procedures, colostomies and occasionally even ileostomies are sometimes appropriate measures applicable in patients with recurrent tumours to deal with problems of tumour causing mechanical bowel obstruction to provide relief and alleviate suffering. If there is a large tumour burden and the patient at an advanced late stage of disease with poor nutritional status from extensive hepatic involvement or gross ascites then even these palliative procedures may not be indicated nor appropriate. In carefully selected cases however, the patient's condition may sometimes be improved by a course of total parenteral nutrition (TPN) and younger subjects be made sufficiently fit for surgery, a surgical approach may then be appropriate even in the presence of advanced bulky disease if it is felt that surgical resection would relieve symptoms or prolong survival and especially if options for further adjunctive therapy exists.

CONCLUSION

This brief review has only covered the current surgical strategies in ovarian cancer particularly of the epithelial type and has not touched on the roles of adjunctive therapies as currently employed using either cytotoxic chemotherapy or whole abdominal radiotherapy. It is intended to underscore the fact that in the overall management of ovarian cancer a well planned surgical strategy forms the cornerstone of therapy in all stages and phases of the disease. A thorough surgical exploration is essential for a full staging procedure which ensures an accurate stage allocation and facilitates the selection of appropriate adjuvant therapy. Adequate debulking surgery by placing the patient into an optimally resected category enables maximum benefit to be derived from currently available adjunctive therapies which are likely to induce a complete remission only in this group of patients with optimally resected disease. Complete clinical remissions if pathologically confirmed are associated with a significantly improved likelihood of long term survival. Currently, the only definitive method to document a complete pathological remission is a second look laparotomy. Palliative procedures and second explorations may be appropriate in carefully selected patients to relieve symptoms and/or debulk disease in an attempt to prolong survival.

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