Peertechz

CLINICAL GROUP

JOURNAL OF Surgery and Surgical Research OPEN ACCESS JOURNAL

ISSN: 2455-2968 DOI: https://dx.doi.org/10.17352/jssr

Review Article

Port-Site Metastasis (PSM): Definition, clinical contexts and possible preventive actions to reduce risk

Giulio Perrotta*

Psychologist sp.ing in Strategic Psychotherapy, Forensic Criminologist, Legal Advisor sp.ed SSPL, Researcher A., "General and Emergency Surgery Clinic", Polytechnic University of Marche, Via Tronto n. 10 / a, 60126, Torrette - Ancona , Italy

Received: 19 October , 2021
Accepted: 30 November, 2021
Published: 02 December, 2021

***Corresponding authors:** Giulio Perrotta, Psychologist sp.ing in Strategic Psychotherapy, Forensic Criminologist, Legal Advisor sp.ed SSPL, Researcher A., "General and Emergency Surgery Clinic", Polytechnic University of Marche, Via Tronto n. 10 / a, 60126, Torrette - Ancona, Italy, E-mail: info@giulioperrotta.com

ORCID: https://orcid.org/0000-0003-0229-5562

https://www.peertechzpublications.com

Check for updates

Abstract

The "port-site metastasis" represents a tumor recurrence that develops in the abdominal wall within the scar tissue of the insertion site of one or more trocars, after laparoscopic surgery, not associated with peritoneal carcinomatosis. This last aspect is central because in the literature some isolated cases are reported, but most cases are associated with peritoneal carcinomatosis. The first case in the literature dates back to 1978 and in the literature, the incidence varies from 1% to 21%, although most published research reports a very small number of patients. Currently, the incidence in a specialized cancer center is consistent with the incidence of recurrence on a laparotomy scar. Possible mechanisms for cell implantation at the port site are direct implantation into the wound during forced, unprotected tissue retrieval or from contaminated instruments during tumor dissection; the effect of gas turbulence in lengthy laparoscopic procedures, and embolization of exfoliated cells during tumor dissection or hematogenous spread. Probably, however, the triggering mechanism is necessarily multifactorial. To date, the only significant prognostic factor in patients diagnosed with port-site metastasis is the interval between laparoscopy and the diagnosis of the port site: in fact, patients who develop the port site within 7 months after surgery have a generally worse prognosis, as well as port-site metastasis are more frequent in advanced cancers and the presence of ascites. To reduce the risk, the following measures are proposed in the literature: 1) Select the patient who does not have a metastatic oncologic condition or friable cancerous masses or lymph node spread or attached external or intracystic vegetations, preferring well-localized, benign or low-malignant or otherwise intact tumors; 2) Use wound protectors and use of protective bags (or endo bag) for tissue retrieval; 3) Peritoneal washing with heparin, to prevent free cell adhesion, or washing with cytocidal solutions. Evaluate the utility of using Povidone-iodine, Taurolidine (which has anti-adhesion activity and decreases proangiogenic factors), and chemotherapy products; 4) Avoid removing pneumoperitoneum with trocars in place; 5) Avoiding direct contact between the solid tumor and the port site; 6) Prefer laparoscopy to laparotomy, if possible; 7) Avoid the use of gas or direct CO_2 insufflation, although in literature the point is controversial and deserves more attention and study, as the initial hypothesis that CO_2 increased the invasion capacity of tumor cells (in vitro and in vivo) has been refuted several times. Insufflation of hyperthermic CO_2 and humidified CO_2 leads to a better outcome in patients with a malignant tumor who undergo a laparoscopic procedure compared with normal CO_2 pneumoperitoneum; 8) Comply with surgical protocols and techniques by updating one's surgical skills, as it has been demonstrated, as already reported here, the presence of cancerous cells on instruments, washing systems and trocars (in particular, on the trocars of the first operator). Suturing all layers of the abdominal wall decreases the risk of the port site; 9) Avoid excessive manipulation of the tumor mass during the surgical/operative procedure.

Contents of the manuscript

Introduction. General profiles

Video-laparo-surgery or laparoscopy is a surgical technique that involves performing abdominal surgery without opening the wall; it consists, therefore, in performing surgery without performing a laparotomy but using (as in endoscopy) a camera connected to a monitor and thin surgical instruments (such as forceps, scissors, suture, electrocoagulation and needle holders) that are introduced through small holes made in the abdominal wall. To do this, it is necessary, first of all, to introduce a gas (CO_2 or carbon dioxide) into the abdominal cavity to create enough space to be able to maneuver the instruments, through a small incision around the navel, semicircular or longitudinal, of a little more than one centimeter [1].

In the past, without the current radiological diagnostic

Citation: Perrotta G (2021) Port-Site Metastasis (PSM): Definition, clinical contexts and possible preventive actions to reduce risk. J Surg Surgical Res 7(3): 088-092. DOI: https://dx.doi.org/10.17352/2455-2968.000144

capabilities, most diagnoses requiring surgery were made by laparotomy, i.e. open surgery, with the risk of negative outcomes in terms of complications, hospital stay, and post-operative recovery. The idea of minimizing the invasiveness of a diagnostic assessment, although it seems rather recent, has never been "foreign" to medicine. Already in 1902 Georg Kelling, a surgeon from Dresden performed the first laparoscopic procedure on a small dog. In 1910, Hans Christian Jacobaeus, of Swedish origin, performed the first laparoscopy on a human being. Subsequently, numerous surgeons perfected the technique and made it popular, but almost always limited to gynecologic applications. The first publication with an enlarged object was by Raoul Palmer in the 1950s, followed by those of Frangenheim and Semm. In 1968, Philippe Mouret used laparoscopy for differential diagnosis of appendicitis, while Hans Lindermann and Kurt Semm used CO_2 insufflation around the early 1970s [2].

Also in those years, in 1972, Clarke published the first laparoscopic film [3], while Mouret dissolved an adhesion bridle in a case of intestinal occlusion laparoscopically [4]. In 1975, Tarasconi performed the first laparoscopic organ resection reported in the literature [5]. In 1981, Semm performed the first laparoscopic appendectomy [6], but was ostracized by his professional environment and even suspended by the German Surgical Society from medical-surgical practice for performing an unethical surgical manoeuvre. Since those years, the indications for the use of surgical scoping have progressively extended not only to various pathologies but also to other districts, such as, for example, inguinal hernias, thorax or arthroscopies [2] up to much more serious and compromising pathological conditions, such as the colorectal district, in which Jacobs performed the first laparoscopy in history [7], also criticized and challenged.

However, despite the ostracism of certain circles, over the years the validity, efficacy, efficiency and cost-effectiveness of the laparoscopic surgical technique compared to open surgery (and/or laparotomy) has been demonstrated; however, this enthusiasm, again during the first half of the 1990 decade, was partially diluted when single cases or case studies on the risk of metastasis at the trocar port site began to emerge in the literature [8]. Therefore, while the video laparoscopic approach to pathology has demonstrated undoubted advantages such as a reduction in the extent of the surgical wound and therefore in-wall complications, a reduction in manual traction and tissue manipulation, limitation of blood loss, as well as a decrease in immune activation and catabolic response to surgical trauma, reduction of postoperative pain and reduction of hospitalization time, resulting in a more rapid resumption of work; on the other hand, the issue under consideration is concrete, although statistically rare, and therefore deserves special attention, especially when the morbid condition is referred to cancer [9].

Clinical contexts

If we were to define the object of study of "port site metastasis", it would be a tumor recurrence that develops in the abdominal wall within the scar tissue of the insertion site of one or more trocars, after laparoscopic surgery, not associated with peritoneal carcinomatosis [10]. Precisely this last aspect is central since a few isolated cases are reported in the literature but most cases are associated precisely with peritoneal carcinomatosis.

The first case in the literature dates back to 1978 [11] and in the literature, the incidence varies from 1% to 21%, although most published research reports a very small number of patients [12,13]. Currently, the incidence in a specialized cancer center is consistent with the incidence of recurrence on a laparotomy scar [12].

Possible mechanisms for cell implantation at the port site are direct implantation into the wound during forced, unprotected tissue retrieval or from contaminated instruments during tumor dissection; the effect of gas turbulence in lengthy laparoscopic procedures, and embolization of exfoliated cells during tumor dissection or hematogenous spread. Probably, however, the triggering mechanism is necessarily multifactorial [14].

Another publication [15] attempted to concretely identify potential circumstances favoring metastatic spread at the portal site:

1. Direct contact between the solid tumor and the portal site increases local tumor growth;
2. Laparoscopy is associated with less intraperitoneal tumor growth than laparotomy;
3. CO_2 insufflation promotes tumor growth to the peritoneum and is associated with more abdominal wall metastasis than gasless laparoscopy.

However, this latter aspect has been repeatedly challenged and excluded or at least reduced to a secondary risk that is not perfectly relevant, instead emphasizing other factors: local trauma, tumor manipulation, biological properties of the tumor mass, and individual surgical skills [16,17].

Another study [18] focused on the technical comparison between laparoscopy and laparotomy, claiming that:

1. Tumor growth after laparotomy is greater than after endoscopy;
2. Tumor spread is worse after laparoscopy CO_2 than after laparotomy;
3. Some of the disadvantages of CO_2 laparoscopy can be treated by using local treatments or gasless laparoscopy.

The risk of dissemination appears high when large numbers of malignant cells are present. Adnexal tumors with external vegetation and bulky lymph nodes should be considered as contraindications to CO_2 laparoscopy [18].

However, in the literature, there are many contrary cases, where the hypothesis of dissemination by laparoscopy tends to be excluded. This is the case of malignant tumors of the gallbladder [19] or the urinary tract [20]; while in the

Citation: Perrotta G (2021) Port-Site Metastasis (PSM): Definition, clinical contexts and possible preventive actions to reduce risk. J Surg Surgical Res 7(3): 088-092. DOI: https://dx.doi.org/10.17352/2455-2968.000144

hypothesis of uterine cancer [21] specific precautions are suggested to keep the risk around 0-1%:

1. Abdominal wall protection;
2. Avoidance of morcellation of the tumor;
3. Adequacy of surgical technique.

However, morcellation of suspected solid tumors, treatment of adnexal tumors with external vegetation but without peritoneal spread, and bulky lymph nodes should be considered as contraindications to CO2 laparoscopy (so-called Chimney Effect) [21].

Another work [22] focuses attention on the main pathophysiological factors attached to the risk of metastatic spread:

1. Direct contact implantation;
2. Pneumoperitoneum;
3. Gas used;
4. Trocar placement and related tissue trauma;
5. Visceral manipulation;
6. Frequent instrumental reintroduction.

Yet another work [23] instead emphasizes more pointedly the conditions for developing recurrences at the site of the port:

1. Viable tumor cells must be freed from the primary tumor; they must be transported to a wound and find there a favorable environment for growth;
2. Traumatic manipulation of the tumor;
3. Trocar slippage;
4. Fluid projection, as well as poor extraction techniques, can cause the implantation of malignant cells into the subcutaneous tissue.

The recent literature of the last five years confirms what has been stated so far, suggesting however to differentiate the investigation based on the type of district involved, morbid condition, and general and specific conditions of the patient. To date, the only significant prognostic factor in patients diagnosed with port site metastasis is the interval between laparoscopy and the diagnosis of the port site: in fact, patients who develop the port site within 7 months after surgery have a generally worse prognosis, as well as port-site metastasis are more frequent in advanced cancers and the presence of ascites [24-28].

Possible preventive actions to reduce risk. Conclusions

The central question is, therefore: is it possible to prevent the risk of port-site metastasis? The answer cannot, at present, be completely affirmative but it is possible to reduce the risk by remaining around 1% of cases by implementing these precautions derived from surgical experience and the literature:

1. Select the patient who does not have a metastatic oncologic condition or friable cancerous masses or lymph node spread or attached external or intracystic vegetation, preferring well-localized, benign or low-malignant or otherwise intact tumors.
2. Use wound protectors and use of protective bags (or endo bags) for tissue retrieval.
3. Peritoneal washing with heparin, to prevent free cell adhesion or washing with cytocidal solutions. Evaluate the utility of using Povidone-iodine, Taurolidine (which has anti-adhesion activity and decreases proangiogenic factors), and chemotherapy products [29].
4. Avoid removing pneumoperitoneum with trocars in place.
5. Avoid direct contact between the solid tumor and the port site.
6. Prefer laparoscopy to laparotomy, if possible and if it does not diminish the opportunities to preserve the patient from clinical risk and danger.
7. Avoid the use of gas or direct CO_2 insufflation, although in literature the point is controversial and deserves more attention and study, as the initial hypothesis that CO_2 increased the invasion capacity of tumor cells (in vitro and in vivo) has been refuted several times. Insufflation of hyperthermic CO_2 and humidified CO_2 leads to a better outcome in patients with a malignant tumor who undergo a laparoscopic procedure compared with normal CO_2 pneumoperitoneum [30].
8. Comply with surgical protocols and techniques by updating one's surgical skills, as it has been demonstrated, as already reported here, the presence of cancerous cells on instruments, washing systems, and trocars (in particular, on the trocars of the first operator). Suturing all layers of the abdominal wall decreases the risk of the port site [31].
9. Avoid excessive manipulation of the tumor mass during the surgical/operative procedure.

Future research on this object of investigation should focus on prospective randomized trials, paying particular attention to the psychological profiles of patient management [32-43] and the links with the immune system, since it has been demonstrated in non-recent studies that laparoscopy implies less systemic immunosuppression after surgery compared to laparotomy (noting lower IL6 levels and a lower increase in CD4 and CD8 subpopulations) [44]; furthermore, CO_2 has been shown to induce in vitro a worsening in peritoneal macrophage function, with lower cytokine and TNFa release and a negative effect on peritoneal defense mechanisms [45].

Citation: Perrotta G (2021) Port-Site Metastasis (PSM): Definition, clinical contexts and possible preventive actions to reduce risk. J Surg Surgical Res 7(3): 088-092. DOI: https://dx.doi.org/10.17352/2455-2968.000144

References

1. Corcione F, Miranda L, Ruotolo F (2019) Chirurgia laparoscopica. Idelson-Gnocchi Ed 448. Link: https://bit.ly/3l9u86b
2. Olmi S, Foschi D, Croce E (2017) Trattato di chirurgia laparoscopica. Apparato digerente, surrene e obesità. Edra Ed 592. Link: https://bit.ly/3EaCnww
3. Clarke HC (1972) Laparoscopy – new instruments for suturing and ligation. Fertil Steril 23: 274-277. Link: https://bit.ly/3Dfm2VX
4. Konjic F, Idrizovic E, Hasukic I, Jahic A (2016) Laparoscopic management of adhesive small bowel obstruction. Acta Inform Med 24: 69-71. Link: https://bit.ly/3xG66uK
5. Tarasconi JC (1981) Endoscopic salpingectomy. J Reprod Med. 26: 541-545. Link: https://bit.ly/3EdWXfo
6. Semm K (1983) Endoscopic Appendectomy. Endoscopy 15: 59-64. Link: https://bit.ly/3xF95nn
7. Jacobs M, Verdeja JC, Goldstein HS (1991) Minimally invasive colon resection (laparoscopic colectomy). Surg Laparosc Endosc 1: 1: 144-150. Link: https://bit.ly/31kVHZi
8. Ota DM, Nelson H, Weeks JC (1994) Controversies regarding laparoscopic colectomy for malignant diseases. Curr Opin Gen Surg 208-213. Link: https://bit.ly/3o8fRyH
9. Champault G (1996) Laparoscopic colectomy. Tecniques and indications. J Chir (Paris) 133: 247-261.
10. Reymond MA, Schneider C, Kastl S, Hohenberger W, Köckerling F (1998) The pathogenesis of port-site recurrences. J Gastrointest Surg 2: 406-414. Link: https://bit.ly/3oaQNY1
11. Dobronte Z, Wittmann T, Karácsony G (1978) Rapid development of malignant metastases in the abdominal wall after laparoscopy. Endoscopy 10: 127-130. Link: https://bit.ly/3d4rLU3
12. Nezhat C (2017) Nezhat's Operative Gynecologic Laparoscopy and Hysteroscopy. 3rd Ed., Kindle Ed.
13. Huang KG, Wang CJ, Chang TC, Liou JD, Hsueh S, et al. (2003) Management of port-site metastasis after laparoscopic surgery for ovarian cancer. Am J Obstet Gynecol 189: 16-21. Link: https://bit.ly/3ro9J7D
14. Martinez J, Targarona EM, Balagué C, Pera M, Trias M (1995) Port site metastasis. An unresolved problem in laparoscopic surgery. A review. Int Surg 80: 315-321. Link: https://bit.ly/3pyn1ft
15. Canis M, Botchorishvili R, Wattiez A, Pouly JL, Mage G, et al. (2000) Cancer and laparoscopy, experimental studies: a review. Eur J Obstet Gynecol Reprod Biol 91: 1-9. Link: https://bit.ly/3EaKLw7
16. Bouvy ND, Marquet RL, Jeekel H, Bonjer HJ (1996) Impact of gas(less) laparoscopy and laparotomy on peritoneal tumor growth and abdominal wall metastases. Ann Surg 224: 694-700. Link: https://bit.ly/3DaGxTX
17. Schaeff B, Paolucci V, Thomopoulos J (1998) Port site recurrences after laparoscopic surgery. A review. Dig Surg 15: 124-134. Link: https://bit.ly/3loY7NL
18. Köckerling F, Reymond MA, Schneider C, Hohenberger W (1997) Errors and risks in oncologic laparoscopic surgery. Chirurg 68: 215-224. Link: https://bit.ly/3G6061l
19. Reymond MA, Schneider C, Hohenberger W, Köckerling F (1997) Pathogenesis of puncture-site metastases after laparoscopy. Zentralbl Chir 122: 387-394. Link: https://bit.ly/3xE5q9e
20. Paolucci V (2001) Port site recurrences after laparoscopic cholecystectomy. J Hepatobiliary Pancreat Surg 8: 535-543. Link: https://bit.ly/3roHndj
21. Cicco A, Salomon L, Saint F, Hoznek A, Chopin D, et al. (2001) Retroperitoneal laparoscopic surgery and carcinogenic risk. Prog Urol 11: 8-15. Link: https://bit.ly/31dwVKO
22. Conzo G, Grillo M, Candela G, Campione M, Casaburi V, et al. (2002) Parietal metastasis in laparoscopic surgery of colorectal carcinoma. G Chir 23: 216-220. Link: https://bit.ly/3lnWkss
23. Steinert R, Lippert H, Reymond MA (2002) Tumor cell dissemination during laparoscopy: prevention and therapeutic opportunities. Dig Surg 19: 464-472. Link: https://bit.ly/2ZFnO58
24. Soreide K, Guest RV, Harrison EM, Kendall TJ, Garden OJ, et al. (2019) Systematic review of management of incidental gallbladder cancer after cholecystectomy. Br J Surg 106: 32-45. Link: https://bit.ly/3lqq8oh
25. Yao L, Yang K, Li X, Zhang Z, Zhang C, et al. (2016) Comparison between completely and traditionally retroperitoneoscopic nephroureterectomy for upper tract urothelial cancer. World J Surg Oncol 14: 171. Link: https://bit.ly/3rEFjyj
26. Mantica G, Smelzo S, Ambrosini F, Tappero S, Parodi S, et al. (2020) Port-site metastasis and atypical recurrences after robotic-assisted radical cystectomy (RARC): an updated comprehensive and systematic review of current evidences. J Robot Surg 14: 805-812. Link: https://bit.ly/3Dfmkw1
27. Swierz MJ, Storman D, Riemsma RP, Wolff R, Mitus JW, et al. (2020) Transarterial (chemo)embolisation versus no intervention or placebo for liver metastases. Cochrane Database Syst Rev 3: CD009498. Link: https://bit.ly/3d4A6XZ
28. Lago V, Gimenez L, Matute L, Padilla-Iserte P, Cárdenas-Rebollo JM, et al. (2019) Port site resection after laparoscopy in advance ovarian cancer surgery: time to abandon? Surg Oncol 29: 1-6. Link: https://bit.ly/3rk2TjA
29. Wittich P, Mearadji A, Marquet RL, Bonjer HJ (2004) Irrigation of port sites: prevention of port site metastases? J Laparoendosc Adv Surg Tech A 14: 125-129. Link: https://bit.ly/3xK0NuC
30. Gao Q, Guo L, Wang B (2020) The pathogenesis and prevention of port-site metastasis in gynecologic oncology. Cancer Manag Res 12: 9655-9663. Link: https://bit.ly/3G8Hz4R
31. Agostini A, Robin F, Jais JP, Aggerbeck M, Vildé F, et al. (2002) Peritoneal closure reduces port site metastases: results of an experiment in a rat ovarian cancer model. Surg Endosc 16: 289-291. Link: https://bit.ly/3d34cet
32. Perrotta G (2019) Anxiety disorders: definitions, contexts, neural correlates and strategic therapy. J Neurol Neurosci 6: 046. Link: https://bit.ly/3d4oCDI
33. Perrotta G (2019) Post-traumatic stress disorder: Definition, contexts, neural correlations and cognitive-behavioural therapy. J Pub Health Catalog 2: 40-47. Link: https://bit.ly/3I2Ly4F
34. Perrotta G (2019) Sleep-wake disorders: Definition, contexts and neural correlations. J Neurol Psychol 7: 09. Link: https://bit.ly/3rpSCIO
35. Perrotta G (2019) Depressive disorders: Definitions, contexts, differential diagnosis, neural correlates and clinical strategies. Arch Depress Anxiety 5: 009-033. Link: https://bit.ly/3lp8hy6
36. Perrotta G (2019) Panic disorder: definitions, contexts, neural correlates and clinical strategies. Curr Tr Clin Med Sci 1: 2019. Link: https://bit.ly/3rroM0m
37. Perrotta G (2019) Obsessive-Compulsive Disorder: definition, contexts, neural correlates and clinical strategies. Journal of Neurology 4: 08-16. Link: https://bit.ly/3EcCibO
38. Perrotta G (2019) The acceptance in the elaboration of mourning in oncological diseases: definition, theoretical models, and practical applications. Needs analysis and subjective oncological reality. Biomed J Sci Tech Res 21: 15573-15585. Link: https://bit.ly/3G60pJx

Citation: Perrotta G (2021) Port-Site Metastasis (PSM): Definition, clinical contexts and possible preventive actions to reduce risk. J Surg Surgical Res 7(3): 088-092. DOI: https://dx.doi.org/10.17352/2455-2968.000144

39. Perrotta G (2020) Psychological trauma: definition, clinical contexts, neural correlations and therapeutic approaches. Curr Res Psychiatry Brain Disord CRPBD-100006. Link: https://bit.ly/3xHOqPm

40. Perrotta G (2020) The strategic clinical model in psychotherapy: theoretical and practical profiles. J Addi Adol Beh 3. Link: https://bit.ly/2ZFo3x4

41. Perrotta G (2020) Accepting "change" in psychotherapy: from consciousness to awareness. J Addiction Research and Adolescent Behaviour 3. Link: https://bit.ly/3oifcuZ

42. Perrotta G (2021) Maladaptive stress: Theoretical, neurobiological and clinical profiles. Arch Depress Anxiety 7: 001-007. Link: https://bit.ly/3rq6FYM

43. Perrotta G (2021) Strategic psychotherapy and the "decagonal model" in clinical practice. Ann Psychiatry Treatm 5: 028-035. Link: https://bit.ly/3d6DuBv

44. Ost MC, Patel KP, Rastinehad AR, Chu PY, Anderson AE, et al. (2008) Pneumoperitoneum with carbon dioxide inhibits macrophage tumor necrosis factor-alpha secretion: source of transitional-cell carcinoma port-site metastasis, with prophylactic irrigation strategies to decrease laparoscopic oncologic risks. J Endourol 22: 105-112. Link: https://bit.ly/3o8z8jC

45. Ramirez PT, Wolf JK, Levenback C (2003) Laparoscopic port-site metastases: etiology and prevention. Gynecol Oncol 91: 179-189. Link: https://bit.ly/2ZEOliX

Citation: Perrotta G (2021) Port-Site Metastasis (PSM): Definition, clinical contexts and possible preventive actions to reduce risk. J Surg Surgical Res 7(3): 088-092. DOI: https://dx.doi.org/10.17352/2455-2968.000144