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Prophylactic drainage in abdominal surgery in adults: true utility?

Drenaje profiláctico en cirugía abdominal en adultos: ¿verdadera utilidad?

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Drainage, surgical drainage, abdominal surgery.

Palabras clave:
Drenaje, drenaje quirúrgico, cirugía abdominal.

ABSTRACT

Background: "Prophylactic drainage" is a drain system left into a space to drain any collections that could stay after surgery. Indications are so much discussed. **Methods:** To update the information on this concept, we conducted a descriptive review since 1980 to November 2016 identifying articles related to drainage in abdominal surgery. **Results:** It was not possible to perform a meta-analysis of second order for not being sufficiently similar. The different surgical techniques on intra-abdominal organs were analized. **Discussion:** The use of "prophylactic" abdominal drainage dates since there is evidence of the practice of medicine and is now even used routinely. Various studies show that it is not necessary to drain the abdominal cavity in digestive surgery except in surgery of esophageal and subsequent exploration of bile ducts where there is little described. The use of drainage of the abdominal cavity may contribute to the infection of surgical site and increased hospital stay among other complications.

RESUMEN

Antecedentes: *El "drenaje profiláctico" es aquél en el que se deja un drenaje en un espacio para vaciar posibles colecciones que pudiesen alojarse posterior a una cirugía. Las indicaciones son muy discutidas.* ***Métodos:*** *Para actualizar la información sobre este concepto se realizó una revisión descriptiva de 1980 a noviembre de 2016 identificando los artículos relacionados con drenajes en cirugía abdominal.* ***Resultados:*** *No fue posible realizar un metaanálisis de segundo orden (second-order meta-analysis) por no ser lo suficientemente similares. Se analizaron las diferentes técnicas quirúrgicas sobre los órganos intraabdominales.* ***Discusión:*** *El uso de drenajes "profilácticos" abdominales data desde que se tiene evidencia de la práctica de la medicina y actualmente algunos cirujanos lo usan incluso de manera rutinaria. Los diferentes estudios demuestran que no es necesario drenar la cavidad abdominal en cirugía digestiva, excepto en cirugía esofágica y posterior a exploración de vías biliares cuya descripción es escasa. El uso de drenajes de la cavidad abdominal puede contribuir a infección del sitio quirúrgico y estancia hospitalaria prolongada, entre otras complicaciones.*

INTRODUCTION

It is well known that all intra-abdominal collections require drainage through any available approach, i.e., imaging-guided percutaneous puncture, transvaginal or transrectal puncture or surgically, either laparoscopically or in open surgery; these situations will be referred to as "therapeutic drains". Likewise, drains have been placed in the abdominal cavity to control fistulas of the digestive tract and, less frequently, of the urinary tract.

"Prophylactic drain" refers to a drain placed in a recess or space in the abdominal cavity, to empty possible collections that may form within them after surgery.

The use of abdominal drains dates back as far as evidence on medical practice; Hippocrates (IV century BC) used them to drain purulent thoracic collections as well as ascitic fluid, but these drains had a therapeutic purpose and were not prophylactic.[1]

In 1809, Ephraim McDowell, a surgical gynecologist considered the father of oophorectomy, placed a long silk suture from the ovarian pedicle to the exterior after the removal of an ovarian tumor: this was the first prophylactic drain.[1] Other great surgeons, such as Theodor Billroth (1829-1894), were

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convinced of the use of prophylactic drains in the abdominal cavity after surgery of the gastrointestinal tract. Robert Lawson Tait, a renowned Scottish gynecologist who also lived in the 19th century, stated "if in doubt, drain" and doctor William Halsted, the famous American surgeon, declared that the more imperfect the surgeon's technique, the greater the need for drains… not draining everything is better than its ignorant use.[2]

Subsequently, prophylactic drains were used with the purpose of removing possible collections of ascites, blood, bile, chyle and gastrointestinal or pancreatic juice, to avert the possibility of infection or to prevent their toxic effects.[3]

Many articles have been published on the use of prophylactic drains in abdominal surgery, including controlled and randomized clinical trials, that conclude these are of limited utility in the prevention of collections and they even lead to complications in most surgeries.[4,5] However in daily practice, some surgeons still place them as a "safety key" after a "difficult" surgery, and even use them routinely, regardless of the intra-abdominal organ operated and the surgical technique used.

This study is a descriptive review of comparable cases and meta-analyses, and although they are not similar enough to carry out a second-order meta-analysis, it makes it possible to establish a position on the subject.

METHODS

To clarify the concept of use of "prophylactic drains" in current abdominal surgery, a systematic review of the subject was conducted by electronically searching the Medline/PubMed and EBSCOhost databases from 1980 through November 2016, in order to identify articles pertaining to drains in abdominal surgery. The following search terms were used: "drainage", "surgical drainage", "intraperitoneal drainage", "abdominal drainage", "gastrointestinal surgery", "prophylactic drainage" (in English), as well as *"drenaje abdominal"*, *"drenaje en cirugía abdominal"* (in Spanish). The former terms were combined with the following: "gastrointestinal organs", "stomach", "duodenum", "small intestine", "colon", "appendix", "gallbladder", "liver", "spleen", "urinary tract" and their equivalent in Spanish.

Once the studies fulfilling the aforementioned criteria were found, they were considered eligible for analysis if they were randomized, comparative and prospective clinical studies, the full text was available, they included patients over the age of 18, they clearly mentioned the type of surgical intervention, and compared the use or non-use of drains. Gynecological surgery studies were excluded.

The purpose of the search was to determine the indications proposed for the use of "prophylactic drains" and to precisely determine, in studies of various abdominal surgeries, their usefulness for reducing collections and residual abscesses, and for the early diagnosis of anastomotic leaks and bleeding, as well as the morbidity and complications resulting from their use.

RESULTS

For practical purposes, abdominal surgeries were divided according to the different surgical techniques employed on various intra-abdominal organs, to further clarify the conclusions.

Esophagus and esophagogastric junction

There are no comparative studies on the usefulness or lack thereof of prophylactic drains in surgery of the esophagus or the esophagogastric junction, except for a single retrospective study by Tang H et al.[6] with no comparison between groups. The authors associated the fact of placing a drain to the diagnosis of thoracic dehiscence; they concluded that it was useful in the detection of anastomotic dehiscence, if it is located in the thorax.

Systematic reviews by Petrowsky[4] and Messager[7] on surgery of the esophagogastric junction found no conclusive evidence on the usefulness of placing a drain when the esophagus was incidentally perforated during surgery, nor after resection of the esophagogastric junction and gastric or enteral anastomoses.

Stomach

Gastric and duodenal surgeries may be elective or emergency, and are mainly due to inflammatory conditions or cancer. Currently, there are also gastric restrictive interventions used in bariatric procedures.

In a 1979 retrospective clinical review,[2] O'Connor and Hugh concluded that there was no difference in the outcome of whether a prophylactic drain is placed or not, in terms of the early diagnosis of dehiscences or collections. Recently, a meta-analysis by Wu[3] concluded that leaving a prophylactic drain is useless, and Messager[7] stated that this practice is obsolete. In a clinical study at the Patan Hospital in Nepal, Kumar et al.[8] included 108 patients with subtotal gastrectomy for cancer and D1-D2 lymphatic resection, divided into two groups: with or without drains. No differences were seen in their postoperative course or the development of complications, nor were prophylactic drains of any use. Ishikawa[9] reached the same conclusion in a clinical study on laparoscopic surgery for gastric cancer, as did Wang[10] in a systematic review and meta-analysis.

As for bariatric surgery, in a retrospective study of 353 patients in whom a sleeve gastrectomy was performed with routine placement of a prophylactic drain, Albanopoulos[11] found no leaks or abscesses. The guidelines published by the European society ERAS (Enhanced Recovery After Surgery)[12] state that there is scant evidence supporting the utility of prophylactic drains, but they recommend their placement for the early detection and control of fistulas; if there is no evidence of complication, drains should be removed after 72 hours.

Duodenum and small intestine

Evidence found regarding duodenal surgery includes a prospective, randomized clinical trial in India by Pai et al.,[13] comparing two groups, one with a drain placed near the duodenum and another without a drain. The authors followed 119 patients with perforated peptic ulcer repaired with a Graham patch and found no usefulness of the prophylactic drain. The same conclusion is reached in systematic reviews by Wu[3] and Petrowsky.[4] The search yielded no evidence regarding surgery for trauma or any specific procedures on the small intestine.

Colon and rectum

Dehiscence of colon and colorectal anastomoses with subsequent abdominal sepsis made the use of drains popular for a while, to promptly detect leaks or attempt to control them,[14] but their usefulness could not be conclusively established. Meta-analyses by Samaiya,[15] Karliczek[16] and Zhang[17] concluded that there is not enough evidence to determine the usefulness of prophylactic drains, neither to establish the presence of delayed bleeding and anastomotic leaks nor to prevent abscess formation. In a French multicenter study by the GRECCAR group conducted between 2011 and 2014, that included 469 patients with an intraperitoneal anastomosis following rectal removal for cancer, patients were divided into two arms: with drain and without drain. The authors concluded that prophylactic drains conferred no benefits to the patients.[18]

Cecal appendix

The use of drains after appendectomy in cases of complicated appendicitis has led to multiple studies and reviews. The routine use of drains in these cases is meant to prevent abscess formation or to drain them if necessary; their reported incidence ranges between 14 and 45%.[19] It has been recommended to place the drains in the sites where residual abscesses form most frequently, i.e., the subphrenic and subhepatic recesses and in the pelvic cavity, not only near the appendicular stump but also for the early detection of stump dehiscence or stercoraceous fistulas.[20]

In our review, we found a study carried out by Martinus et al.[21] in Holland. It is a retrospective study of 199 patients who underwent an appendectomy following appendicular perforation. Drains were placed in 120 patients and no drains in 79, although the criteria for the use of drains were not specified. The authors concluded that abdominal drains decreased the frequency of reoperation and

patient readmission. On the other hand, in a retrospective study between 2005 and 2009 that included 209 patients who had undergone an open appendectomy, Rather et al.[22] compared variables such as hospital stay, duration of parenteral antibiotic administration, pain, ileus, infection of surgical site, residual abscess formation, intestinal obstruction, fistulas and mortality. The authors found no advantage from the use of prophylactic drains in these patients; furthermore, they considered that it may be counterproductive, since it led to increased morbidity. Meta-analyses by Cheng[23] and Weledji[24] did not find enough evidence to justify the use of prophylactic drains, whereas a review by Reiffel[25] reported an increase in surgical site infections.

Liver

The criterion to place drains after resection of hepatic segments is to detect bleeding and/or bile leaks from the remaining liver; even the omentum has been placed as a "sealant" or "absorptive surface" for these possible leaks.[26] Comparative studies by Aldameh in 2005,[26] Kim in 2007,[27] and Squires in 2015[28] showed that the incidence of bilomas was the same in groups with and without drains (between 4% and 5%). They also observed a greater incidence of surgical wound infection and thus, a prolonged hospital stay among patients in whom an abdominal drain was placed. A retrospective study by Sakamoto et al.[29] points out that complex resections and a prolonged operative time –albeit this duration is not specified– are independent risk factors for biliary leaks, mainly of central origin.

Gallbladder and biliary tract

Cholecystectomy is one of the most frequent surgeries performed in the world. Schein[30] carried out a survey on the topic and found out that 34% of surgeons place a drain, even routinely. Comparative and randomized clinical trials have been conducted on both open[31] and laparoscopic surgeries,[32-34] and no decrease in postoperative complications was documented in either case. Thus, drain placement offers no advantages when attempting to detect biliary leaks from the cystic duct, accessory cholangiole or biliary bed. A systematic review and meta-analysis by Bugiantella et al.[35] on whether or not to place a drain in cases of elective cholecystectomy concluded that prophylactic drains are of no use in preventing complications.

Shoulder pain is frequent, particularly on the right side, after laparoscopic cholecystectomy. Hence, Jorgensen et al. recommended draining the gas in the immediate postoperative period by placing a drain in the gallbladder bed to decrease this phenomenon.[36] However, in a comparative study by Nursal et al. in 2003 with a control group, the subdiaphragmatic space was drained in an attempt to confirm the decrease in postoperative pain, nausea, and vomiting, but no difference was seen between both groups.[37] The above-cited article by Schein states that placing a drain could be reasonable when bile leak is evident, as in cases of partial cholecystectomy or an inflamed and thickened cystic duct that might be difficult to occlude, but there is no confirming evidence on the subject.[30]

No studies were found establishing the usefulness of placing a drain in the subhepatic recess after biliary tract exploration in cases of choledocholithiasis. The use of the Cattell tube (T tube) is progressively less frequent, since the entry site of the tube in the common bile duct and the suture around it are a potential site for leakage, the original reason for drainage placement, as well as sutures in the biliary tract after the placement of an endoprosthesis.

Spleen

There are few studies dealing on the usefulness of drains after splenectomy. Until the 1980's, placing a drain in the large residual space of the splenic fossa was commonplace; its purpose was to drain blood, serum and pancreatic enzymes. However, in a study by Carmichael et al. (1990),[38] the rate of residual abscess formation was even higher than with no drain. In a case series of 2,009 patients in whom drains were routinely placed, Vecchio et al., from the Surgery Department in Catania, Italy, reported no increase in the incidence of abscess formation, as long as the drains

were removed within the first three days after surgery.[39] Major[40] conducted a clinical study including 54 laparoscopic splenectomies with drain placement and concluded that the routine use of drains is not warranted, regardless of the type of drain.

Pancreas

Studies on drains in pancreatic surgery have been mostly based on patients with cancer and cases of pancreatojejunal anastomoses, due to the high incidence of anastomotic leaks and the subsequent development of pancreatic ascites or secondary chemical peritonitis. There are studies such as those by Van Buren[41] and Witzigmann[42] who, in multicenter, prospective, randomized trials compared the use, or not, of drains after pancreatectomy with pancreatojejunal anastomosis. The authors found that drains were useless in the detection of leaks and their control, nor did they reduce mortality or the frequency of reoperation. However, Ansorge[43] did find a pertinent use in a case series of 315 patients who underwent pancreatoduodenectomy for cancer of the pancreatic head: he reported that the pancreatic fluid exiting through the drain may allow following the fistula by measuring lipase and amylase content. Regardless, complications reported from the use of drains include bleeding, surgical site infection, longer hospital stay and pneumonia, as well as injury to organs by the drain's rigid tip and hernias at the site of drain removal.[44]

DISCUSSION

After analyzing these comparative case studies and meta-analyses, the conclusions tend to report the development of complications when placing a prophylactic drain after performing surgery on intraabdominal organs. The complications observed in patients in whom a prophylactic drain was placed in the abdominal cavity include surgical site infection, prolonged hospital stay and, in cases of surgery of the colon, a greater incidence of anastomotic leaks. This latter observation may relate to reports in the literature stating that leaks and/or anastomotic dehiscence may be due to the presence of a foreign body or drain close to the surgical site.

Hence, we must consider that drains are not antibiotics, they are not hemostatic nor are they a substitute for imaging studies, and we must continue practicing Dr. Halsted's principles: strict asepsis, gentle handling of tissues, careful hemostasis, avoidance of dead spaces and preserving the best possible blood supply to tissues.

We must take into account the meta-analyses' weaknesses because, although the information was standardized, it does not always describe in detail the surgical technique, the findings during surgery, the patients' clinical status, the duration of surgery nor the conditions of the operated tissues; it even fails to mention the type of drains used and the number of days they remained in the abdominal cavity.

Prophylactic drains should not replace a careful and clean surgical technique, with gentle handling of the organs and tissues, thorough removal of an collection of blood, gastrointestinal or purulent secretions, and the limited and careful use of the electrocautery.

CONCLUSIONS

After this review, one can conclude that the routine use of "prophylactic drains" in abdominal surgery is of limited use and there are no absolute indications for their placement in gastrointestinal surgery, even in cases of localized or generalized abdominal sepsis. Drains are more risky than beneficial, since they appear to associate to a greater incidence of surgical site infection, anastomotic dehiscences and delayed bleeding.

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