The place of axial drainage in common bile duct surgery

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Abstract: The study performs a retrospective analysis of the place held by axial drainage in common bile duct surgery starting with the results obtained from a group of 386 patients operated between 1992 and 2011 at the Bucharest Caritas Hospital Surgery Clinic and in the Bucharest Oncology Institute’s Surgery Clinic I. In 80% of cases in this study group, the axial drainage has been used. Elements regarding the surgical procedures used for the patients included in the study are presented and the advantages, indications and counter indications of the axial drainage method derived from our clinical practice are highlighted. Axial drainage has proven to be, from the point of view of the experience stated in the study, the best drainage method for the common bile duct.

Key-Words: common bile duct surgery, axial drainage, stenting of biliary-digestive anastomoses

1 Introduction
Over time, axial drainage has achieved a well deserved position in the classic surgery of benign and malignant obstructions of the common bile duct. Starting from a short listing of the important names related to the evolution of this external biliary drainage method and a brief review of its indications and advantages, the study sets out to present the experience of Bucharest Caritas Hospital Surgery Clinic and Bucharest Oncology Institute’s Surgery Clinic I with respect to axial drainage for the patients included in the study group.

2 Axial drainage of common bile duct
Used as early as the beginning of the previous century, axial drainage has been a constant pursuit for those who understood its value, the method having been modified for improvement or for overcoming the different inconveniences observed over the years of surgical practice. The cumulated experience and trials conducted over the years regarding axial drainage may be illustrated by referencing a series of specialists’ names that have contributed to the widespread usage of axial drainage starting with Hoag (1937), Cole (1948), Goetze (1951, 1959), Claggett and Braasch (1954), Altemeier (1957), Quijano (1957), Munoz (1959), Magoon and Claggett (1958), Praderi (1961) [1] and Smith (1964) [2] who enforced this method in the surgical practice and subsequently with those who had further developed the method such as Saypol and Kurian (1969) [3], Terblanche (1972) [4], Cameron (1969) [5], Heydernych (1969), Stoppa (1980) [6, 7] a. o., who communicated their results regarding transhepatic axial drainage. [8] More recently other specialists such as Tsunoda et al. (1991) and Goseki et al. (1998) [9, 10] can be mentioned for the method they developed.

In Romania, axial drainage was used for the first time in 1965 by Burlui, Mănescu and Constantinescu who improved the technique and developed an original method (1971) [11, 12], that externalizes the drainage tube on a strict extraperitoneal route, through the reopened omphalic vein, procedure that was later on simplified by externalizing the axial drainage tube between the round ligament’s sheets. This transligamentary version is still currently used. [8, 13, 14] (Fig. 1, 2)

Fig. 1 The main uses of the axial biliary drainage: Surgery of the common bile duct; Stenting of the biliary-digestive anastomoses; Transtumoral drilling
Fig. 2 Axial biliary drainage after choledochorrhapsy

In 1995 Brătucu imagined and practiced for the first time the original technique of sutureless hepat jejunal anastomosis. ”The method realizes anastomosis of the segments without using sutures by simply keeping them in apposition with continuous traction exerted via a Foley-type balloon catheter which stents the anastomosis in an axial manner. The balloon is then inflated and traction is exerted on the catheter, enabling the two segments of the anastomosis to remain in place until complete healing (10 days average).” [15]

3 Patients and results
The retrospective study we conducted covers the period between 1992 and 2011, during which 386 surgical procedures involving the common bile duct were performed within the Bucharest Caritas Hospital Surgery Clinic and the Bucharest Oncology Institute’s Surgery Clinic I.

The patients included in the study have been observed from a pre-operative biological status, from an intra-operative lesion complex and from the practiced surgical solution point of view, as well as from the point of view of post-operative evolution in dynamics, at a distance and comparatively.

The pre-operative and post-operative patient assessment has focused on the following parameters: clinical – fever curve, renewal of bowel movements, jaundice remission, cardiovascular and respiratory status, digestive tolerance; biological – cholestasis indices (alkaline phosphatase, bilirubin), hepatic cytolysis indices (transaminase GOT, GPT, GGT); Hct, Hb, leucocytes; imagistic; post-operative – specific and general postoperative complications (fistulas, anastomotic unbinding, anastomotic stenoses, hemorrhage).

However the purpose of this paper is not to present in detail these aspects with respect to patients included in this study, but to highlight the value of axial drainage in common bile duct surgery by stating the aspects related to using this procedure in the periods and clinics mentioned.

Thus, 266 of the procedures were performed for common bile duct lithiasis and 120 for malignant lesions. (Fig. 3)

![Fig. 3 Types of lesion](image)

During the mentioned interval the axial drainage was used in 309 (80% of the) cases. For 19 (5%) of the patients the Kehr drainage was used, while for 58 (15%) of the patients the endoscopic oddian sphincterotomy was performed. (Fig. 4)

![Fig. 4 Types of drainage](image)
duodenal anastomoses and endoscopic oddian sphincterotomies were performed. (Fig. 5) The registered complications consisted in minimum and temporary sub-hepatic biliary leaks (5-6 days) of the subhepatic drain. No deaths occurred pursuing the used surgical procedure within the analyzed patients’ group. In 3% of cases (12 patients) a non specific mortality was recorded.

The advantages of common bile duct axial drainage include: impossibility of contaminating the peritoneum (no peritubular leaks) due to a complete extraperitoneal route for the transligamentary variant, absence of biliary or peritoneal septic complications, easy access for postoperative control or therapy, moreover it represents the sole possibility of stenting high derivations of hepatic ducts or of the convergence, singular-channeling or dual-channeling, and transtumoral drilling. In addition, it allows the possibility of long term or even permanent preservation and also drainage suppression is not followed by persistent drainage or external biliary fistulas.

The disadvantages of common bile duct axial drainage refer to: the set-up’s relative technical difficulty, septic complications such as choleperitoneum or subphrenic abscess for the transparietohepatic variant, the accidental mobilization or dislocation of drainage tubes that may lead to reintervention, the drain presence may represent a failure factor of the common bile duct’s transpapilary endoscopic deobstruction. [13]

In common bile duct surgery the axial drainage must be analyzed as a stenting method for biliary-digestive anastomoses taking into consideration a series of aspects such as lesion type, common bile duct diameter, elements on which the method’s indication are mainly based on, and second, the surgeon’s preference for one procedure or another. Each type of drainage “has its own indications and value, arising precisely from respecting the indications. Enforcing the indications or usage in unindicted cases may compromise any method”. [8]

The procedure’s reliability must be analyzed taking into consideration a series of criteria: patient evolution (favorable or unfavorable); postoperative morbidity (fistulas, anastomotic unbinding, anastomotic stenoses, other associated pathology); postoperative mortality (recorded during admission or under 30 days from the date of the last intervention); survival (where this may be followed); comparative: axial stented biliary-digestive anastomoses compared to stenting through other methods (mainly with Kehr type drainage). Method efficiency, the tradition and experience of the clinics where this study has been carried out, have imposed axial drainage as a biliary decompression method in 80% of cases; just in 5% of the cases it was used the Kehr type drainage, and in 15% of the cases the endoscopic oddian sphincterotomy. Due to the efficiency provided by the axial drainage, the preference for this method is obvious, and its usage in most cases is easily justified.

**Fig. 5 Types of anastomosis**

**4 Discussions**

Axial drainage is the election method used for biliary-digestive derivations performed in case of malignant obstructions and common bile duct neoplasms. In the surgical practice addressing benign obstructions, the selection of axial drainage depends on a series of elements such as intrasurgical difficulties, forecasts regarding the anastomosis tightness and the existing complications. Transligamentary drainage is the best variant, however it is possible only in case of externalizing the drainage tube through the left hepatic duct. The transparietohepatic variant is used when the stenting of the right hepatic duct is necessary. [13] Among the axial drainage counter indications the following may be mentioned: indurated liver lacking elasticity (chronic hepatitis, hepatic steatosis, hepatic cirrhosis and cardiac stasis liver), hepatic hemangiomas concurrently with the intervention, post surgical or posttraumatic hepatic hematomas, frail liver (acute yellow liver dystrophy), recent hepatic traumas, suppurating angiocolitis, hepatic metastases. [16]
understood under these conditions also for stenting biliary-digestive anastomoses.

In case of anastomoses performed for high lesions of the common bile duct, the axial drainage method is the election procedure, most of the times being the only possible stenting method of a difficult and precarious biliary-digestive anastomosis.

For the analyzed patients’ group, the high common bile duct lesions have been mostly benign in nature, and the post-operative evolution has been favorable in most of the cases. The intrahepatic bile ducts presented an enlargement between 12 mm and 25 mm. The cases of post-operative mortality have been caused by associated pathology.

In biliary lithiasis, stenting biliary-digestive anastomoses through axial biliary drainage represents an alternative to other technical solutions, being comparable in results and efficiency. There were 231 cases of biliary lithiasis of the common bile duct that benefited from biliary-digestive anastomoses stented through axial drainage, 130 being common bile duct-duodenal anastomoses stented through axial biliary drainage exteriorized in a transligamentary manner in 80% of cases and transhepatoparietal in 20% of cases. The diameter of the common bile duct varied between 12 mm and 25 mm. The evolution has been favorable, with no specific postoperative morbidity or mortality being recorded. The jaundice remission dynamics was fast (days 4-7 postoperative) and average (8-10 days).

The surgical procedures used were the “en-Y” hepato-jejunostomy anastomosis stented by biliary axial drainage, in some of the cases a double stent was performed (with right transhepatoparietal and left transligamentary exteriorization), in other cases axial stenting with transligamentary exteriorization was performed, and in other cases a segmented resection of biliary duct was performed, the anastomosis being “sutureless” - Brătucu procedure, with double stenting with transligamentary and right transhepatoparietal exteriorization.

Axial drainage was not used in cases where it was strictly counter-indicated or technically impossible to perform.

Of the total of 309 biliary-digestive anastomoses stented through axial biliary drainage, 297 cases had a favorable evolution. The high percentage of good results recommends stenting through axial drainage of biliary-digestive anastomoses as an efficient, safe, viable method ensuring evolution guarantee without anastomotic fistula.

As a stenting method of biliary-digestive anastomoses, the axial drainage has proven its benefits, the results being clearly favorable for high bile duct lesions, precarious biliary-digestive anastomoses [16], in iatrogenic lesion corrective biliary-digestive anastomoses or in completion of transtumoral drilling.

Biliary-digestive anastomoses stented through axial drainage have good and very good results in lesions for which their indication is recommended (biliary lithiasis, dysfunctional biliary-digestive anastomoses, bile duct neoplasms, extrinsic or intrinsic malignant or benign stenoses, other than lithiasis, of the common bile duct, bile duct malformations). [17] These results are comparable or even superior to other alternative solutions, especially when axial biliary drainage is exteriorized in an extraperitoneal manner (transomphalic or transligamentary). The superior results of stenting biliary-digestive anastomoses through axial drainage compared with the absence of drainage or Kehr type drainage resides from the practically unlimited possibility to apply it to any type of biliary-digestive anastomosis in the common bile duct axis, as well as from its advantages, corroborated with the disadvantages of Kehr drainage (choleperitoneum, persistent biliary fistula, late secondary biliary stenoses, peritubular bile leaks, retention in the common bile duct, drain rupture, accidental suppression, impossibility of extraction and prolonged placement).

5 Conclusions

In essence, axial type drainages allow a choledochorrhaphy per primam, advantage which transcystic or Kehr drainages do not provide.

Axial drainage represents a safe method with very good results along a series of interventions within the biliary area. As a stenting procedure for biliary-digestive anastomoses it is an election method in all types of biliary-digestive anastomoses (common bile duct-duodenal and common bile duct-jejunal) and the only alternative in case of high biliary-digestive anastomoses. Removal of the axial drainage tube does not present the risk of persistent drainage. The method is indicated to be used as a safety supplement in the immediate post-operative protection of biliary-digestive anastomoses and choledochorrhaphies. Except for the method’s counter indications, axial drainage has proved its superiority compared to other stenting methods through a series of undisputed advantages.

References:


