

Immediate Effects of Instrumental Dilatation of the Ampulla of Vater

Visual and Histologic Observations in Man

BENEDICT M. REYNOLDS, M.D.

From the Misericordia Hospital, Bronx, New York

THE first recorded description of systematic dilatation of the ampulla of Vater in man is difficult to ascertain. A report by Hoffmeister,¹¹ is an excellent description of the procedure. In a subsequent report, Bakes² described deliberate dilatation with a standard set of dilators, and a similar report was made by Cheever⁸ who used woven urethral catheters.

Aside from reports of direct visual observation in some of the original papers, no visual and histologic study has been undertaken to determine the immediate effects of such dilatation in man. For this purpose that the following study was undertaken.

Method

From a group of 30 consecutive patients subjected to choledochotomy, with or without cholecystectomy, six were selected for study according to the following criteria.

Patients whose common ducts were of smaller caliber than a #6 Bakes dilator were not included. A #6 dilator initially was passed through the ampullary area to eliminate cases in which dilatation would not be required because of anatomic variations,¹⁴ or in which a large calculus may have passed.⁶ Passage of a #3 dilator was then attempted; if unsuccessful, these patients were excluded. Six patients did not fall into the above categories.

In these patients, longitudinal duodeno-

tomy in the second portion of the duodenum was performed for direct visualization of the ampullary area. Stay sutures were placed in the plica longitudinalis for delivery of the sphincteric area to the edges of the duodenotomy. A ureteral catheter was passed for positive identification; then dilators up to size #7 were passed serially under direct vision.

Serial photographs were taken, demonstrating changes caused by progression of the instrument, and at the completion of the procedure a biopsy specimen was taken from the ampullary region. The pancreatic duct was then cannulated to assure patency and the duodenostomy closed longitudinally, with a single layer of interrupted 0 silk sutures. There were no operative mortality or increased morbidity in connection with this study.

Results

In all six patients studied, there were considerable obvious anatomic disruptions caused by the use of from #4 to #6 dilators. Longitudinal tears, varying from 2 to 14 mm., and an intense edema with gross reddening of the mucosa was seen in all instances.

Figure 1 shows the initial passage of a ureteral catheter, Figure 2 the passage of a #4 dilator, Figure 3 the passage of a #6 dilator, and Figure 4 the ampullary orifice with the passage of the ureteral catheter subsequent to dilatation by a #6, and demonstrates an obvious longitudinal tear.

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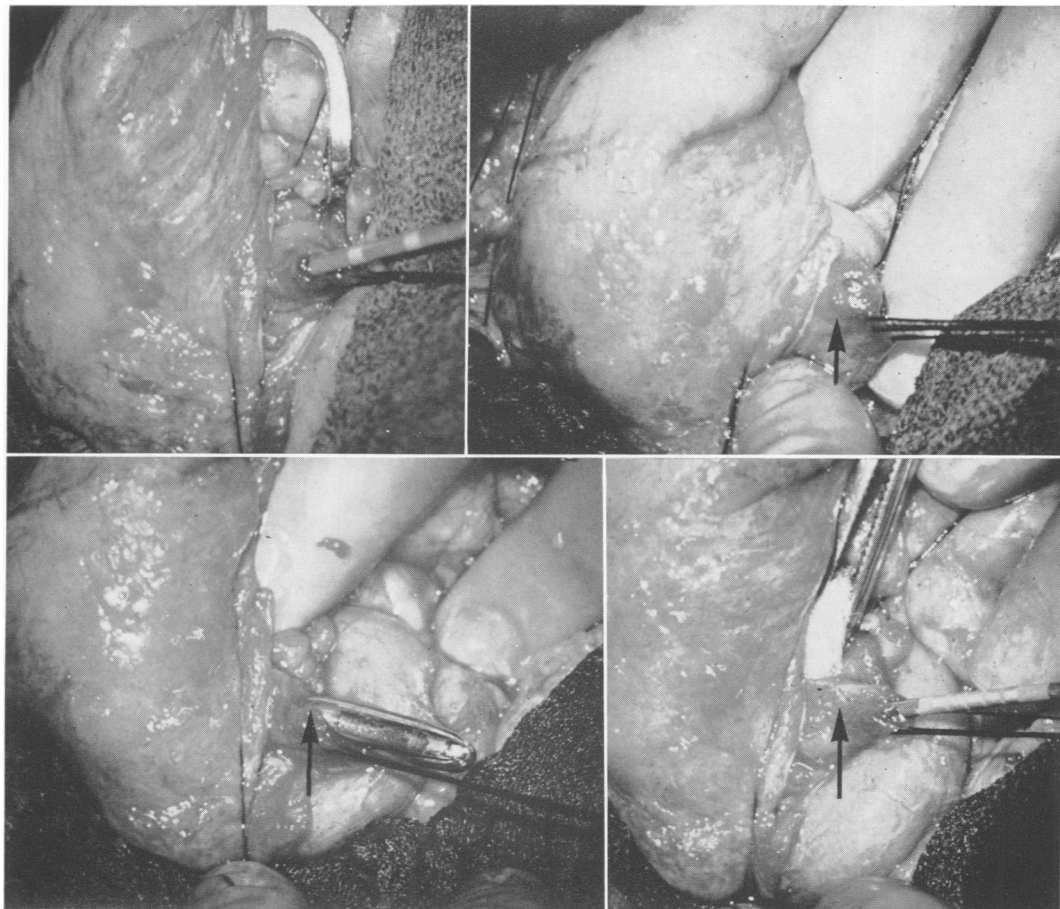


FIG. 1. Ureteral catheter through the ampullary orifice above the stay sutures on the plica longitudinalis.

FIG. 2. Ampulla stretching over a #4 dilator at arrow.

FIG. 3. Passage of a #6 dilator with tearing noted at arrow.

FIG. 4. Ureteral catheter in place with arrow demonstrating the extent of proximal tearing of the ampulla.

Figure 5 shows a typical biopsy after ampullary dilatation with extensive hemorrhage in the submucosal area of the ampulla. These findings were common to all specimens.

Discussion

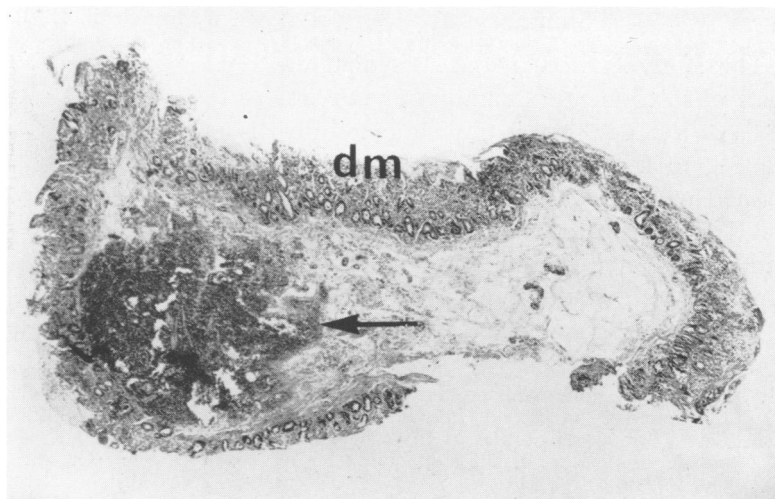
It is recognized that there is considerable anatomic variation in the ampullary area^{9, 15} as well as in the size of the choledochus. In addition to an anatomically large ampulla, recent passage of a calculus can result in a widely patent ampulla

which admits a #6 or larger dilator. By considering these features, 24 of 30 patients were eliminated from study since otherwise they may have been interpreted as having undergone dilatation without disruption.

Dilatation is a force applied by a metallic instrument against a yielding anatomic structure. No standardized method of recording the degree of force applied can be established.

In the initial report by Bakes,² findings at autopsy performed sometime after dilatation to 13 mm. show no scarring and pa-

FIG. 5. Duodenal mu-
cosa—dm. Area of hem-
orrhage is seen in the
sub-mucosal region.



tency of the ampulla. Zawisch-Ossenetz,¹⁶ performed post-mortem dilatation 4 to 6 hours after death and found no evidence of tearing. Rapid autolysis and change of muscle tone in the cadaver, however, negate the significance of these findings. In histologic studies of one sphincter, dilated 76 days before, Ossenetz found some scar tissue with hyperplasia of muscle.

Direct visualization of the ampulla, with histologic examination at the time of dilatation in the dog, was reported by Branch and Zollinger.⁵ They found intense hemorrhagic and edematous reaction to the passage of dilators and subsequent increase of perfusion pressure with stenosis during healing. They then studied a series of patients manometrically in the postoperative period and demonstrated a persistently increased common ductal pressure following dilatation.⁶

Review of the literature failed to reveal reports of long-term follow up after ampullary dilatation which record the size of the dilator passed and the ease or difficulty with which the passage was accomplished.^{1,7} Statistics as to the incidence of disruption of the choledochus in its pancreatic portion during dilatation are also unavailable.

Stenosis has been implicated as the etiology of the post-cholecystectomy syndrome and recurrent choledocholithiasis.¹² There is no direct evidence that stenosis is a late sequel of ampullary dilatation. However the present observations of immediate lacerations and submucosal hemorrhages indirectly indicate that stenosis will follow dilatation through a narrowed ampulla by a #6 Bakes dilator.

There is some agreement that transduodenal sphincterotomy is indicated when a #3 Bakes dilator cannot be passed into the duodenum but less agreement as to what should be done when a #3 dilator is passed readily.¹³ Some suggest dilatation to a #6 or a #7 dilator. This study indicates that once a #3 dilator is passed with ease no further dilatation should be attempted. The ampulla which is not anatomically large or has not been dilated by passage of calculi, may be lacerated by passage of #6 or #7 dilators. Instrumentation of the ampullary orifice should be only to assure patency. Passage of a ureteral catheter suffices for this purpose and sufficiently aids in palpation of the interpancreatic and peripancreatic choledochus and ampullary area. Operative cholangiography further obviates the need for instrumentation.

Summary

This study shows that the immediate effects of instrumental dilatation of the ampulla of Vater in man is traumatic and disrupting to the sphincter of Oddi, if performed with larger than a #3 Bakes dilator. To assure patency of the choledochus, catheter passage or operative cholangiography or both would be a safer procedure.

References

1. Allen, A. W. and Wallace, R. W.: Surgical Management of Stone in Common Bile Duct: Follow-up Studies With Special Reference to Gradual Dilatation of Sphincter of Oddi. *Ann. Surg.*, 111:838, 1940.
2. Bakes, J.: Zur Drainagehosen Gallenchirurgie Und Der Methodischen Dilatation Der Papille. *Zbl. Chir.*, 55:1858, 1928.
3. Boyden, E. A.: The Anatomy of the Choledochoduodenal Junction in Man. *Surg. Gynec. Obstet.*, 104:641, 1957.
4. Boyden, E. A.: The Sphincter of Oddi in Man and Representative Mammal. *Surgery*, 1:25, 1937.
5. Branch, C., Bailey, O. and Zollinger, R.: Instrumental Dilatation of the Papilla of Vater's. *Surg. Gynec. Obstet.*, 66:100, 1938.
6. Branch, C. O., Bailey, O. and Zollinger, R.: Consequences of Instrumental Dilatation of the Papilla of Vater's. *Arch. Surg.*, 38:358, 1939.
7. Brusch, B. E., Ponker, J. L., Damazo, F. and Whitcomb, J.: Evaluation of Dilatation of Sphincter of Oddi. *Arch. Surg.*, 70:766, 1955.
8. Cheever, O.: Instrumental Dilatation of the Papilla of Vater and the Dislodgement of Calculi by Retrograde Irrigation. *Arch. Surg.*, 18:1069, 1929.
9. Eichorn, E. P. and Boyden, E. A.: The Choledochoduodenal Junction in the Dog: A Study of Oddi's Sphincter. *Amer. J. Anat.*, 97:431, 1955.
10. Hendrickson, W. F.: On the Musculature of the Duodenal Portion of the Common Bile Duct and of the Sphincter. *Anat. Anz.*, 17:197, 1900.
11. Hofmeister, V.: Die Methodischen Dilatation der Papilla Chiodeni und die Choledochoduodenal Drainage. *Zbl. Chir.*, 40:5, 1913.
12. Imamoglu, K., Perry, J. F., Jr. and Wangenstein, O. H.: Experimental Production of Gallstones by Incomplete Stricture of the Terminal Common Bile Duct. *Surgery*, 42:623, 1957.
13. Kirtley, J. A., Jr.: Problems in Common Duct Surgery for Nonmalignant Disease. *Current Problems in Surg.*, Yearbook Med. Pub., Dec. 1941, p. 41.
14. Kreilkamp, B. L. and Boyden, E. A.: Variability in Composition of Sphincter of Oddi. *Anat. Rec.*, 76:485, 1940.
15. Mester, Z. G., Csanaky, L. M. and Epstein, O.: Anatomy of Duodenal Papilla and Genesis of Pancreatic Reflux. *Arch. Surg.*, 87:775, 1963.
16. Zawisch-Ossenetz, C.: Histologische Untersuchungen Dehnung Der Papilla Vaters. *Zbl. Chir.*, 55:1868, 1928.

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