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A Study of Visceral Pain as Related to the Biliary Tract.

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Because of the prevalence of disease of the gall bladder and bile ducts, the nature of biliary colic is of extraordinary interest. Recently we have had an opportunity to conduct studies of biliary tract pain upon unanesthetized human subjects, and our findings form the basis for this report.

Patients who had undergone choledochotomy and intubation of the common bile duct several weeks or months previously voluntarily submitted themselves as subjects for these studies. As a preliminary step the condition of the biliary tract was determined by cholangiographic examination. Pain was then produced by sudden distention of the ducts by the introduction of sterile physiological saline solution under pressures varying from 50 to 100 cm. of water. This was accomplished by attaching an infusion flask containing saline solution to the T-tube leading into the common bile duct, and adjusting the pressure by elevating or lowering the flask. The patients were then observed closely to determine the effects of the procedure. Although they were interrogated concerning their sensations during the period of the experiments, leading questions were carefully avoided. In fact, much of the information was volunteered by the subjects without the necessity for questioning.

Among the 15 patients studied, all suffered deep epigastric or right upper quadrant pain following sudden distention of the bile ducts. In 8 of the cases the sensation remained localized while in the remaining 7 there was radiation to the interscapular or right subscapular region. The deep epigastric or right upper quadrant pain occurred earlier than the referred pain by many seconds. In most cases the pain was intense, but occasionally it consisted of only a relatively mild discomfort.

Gradual distention to a pressure of 100 cm. of water, on the other hand, failed to produce pain.

One might expect that those patients experiencing reference of pain to the back prior to operation would suffer a similar subscapular or interscapular pain when the ducts were distended, but no such correlation could be made in our series. The patients, however, without exception stated that the pain in the epigastrium or right

upper quadrant was practically identical with the pain previously experienced from their disease.

TABLE I.
Tabulation of Results of Distention of the Biliary Ducts.

Case	Pressure (cm. of water)	Pain in epigastrium and right hypochondrium	Radiation of pain to the back		Nausea and vomiting	Eructation
			Pre-operative	Upon distention of bile ducts*		
1	60	present	present	present	absent	absent
2	52	"	"	absent	"	"
3	51	"	"	"	present	"
4	55	"	"	present	nausea only	"
5	100	"	absent	"	absent	present
6	100	"	present	absent	"	absent
7	†	"	"	"	"	"
8	60	"	absent	"	"	"
9	†	"	present	present	nausea only	"
10	50	"	"	absent	absent	"
11	50	"	"	present	"	present
12	60	"	"	"	"	absent
13	50	"	"	absent	"	"
14	50	"	absent	"	"	"
15	55	"	present	present	"	"

*The pain in the back developed later than the deep epigastric and right upper quadrant pain.
†Not recorded.

Associated with the pain there was a marked rigidity of the muscles of the abdominal wall, greatest in the right upper quadrant. Inspiratory distress was a frequent accompaniment. It was impossible to examine for localized tenderness because of the intensity of the pain already present.

There was vomiting in only one case, and one other patient vomited a short time after the completion of the experiment. A feeling of fullness in the epigastrium was frequently experienced and 2 patients belched when the ducts were distended. One patient fainted, presumably as a result of the severity of the pain when the biliary ducts were distended.

Our observations are interesting inasmuch as painful sensations identical with biliary colic were produced by distention of the bile ducts. Our results differ from those of Zollinger,[1] who failed to produce reference of pain to the back by distention, in that subscapular of interscapular pain occurred in 7 of our 15 patients. It is significant, moreover, that in all of our cases the deep epigastric or right upper quadrant pain preceded the development of the pain in the back by an appreciable period of time.

[1] Zollinger, Robert, PROC. SOC. EXP. BIOL. AND MED., 1933, **30**, 1260.