Stones may be formed in the common bile duct primarily, or they may lodge in the duct after initially being formed in the gallbladder and traversing the cystic duct. The evidence in support of either mode of development is incomplete and to some extent conflicting. Undoubtedly both mechanisms occur, but there is considerable controversy about their relative frequency. The question is of practical importance, however, because the different possibilities may call for different surgical therapy.

Most surgeons believe common duct stones are more often secondary than primary (25,27,45,52,62). Gallstone disease more commonly affects the gallbladder than the bile ducts, even though bile is supersaturated with cholesterol when secreted by the liver, and hepatic bile reaches greater extremes of supersaturation than does gallbladder bile (3,10,51). Thus, approximately 95% of patients with common duct stones have gallbladder stones, but only 15% of patients with gallbladder stones have common duct stones (25,52,62). The frequency of ductal stones in patients with gallbladder stones increases with age. In patients with cholescystolithiasis common duct stones are more common when the cystic duct is large and when the gallbladder stones are multiple and small (36), factors that would more readily permit passage of stones into the ducts. Finally, patients with stones confined to the gallbladder are usually cured by cholecystectomy, and patients with stones in the gallbladder and common duct are usually cured by cholecystectomy plus choledocholithotomy (15,25,45,52,63).
Stones may also form within the bile ducts, especially in the presence of stasis. Common duct stones (or sludge) are common, for example, in association with biliary stricture or congenital cystic disease of the ducts (34). Choledocholithiasis has been produced experimentally in dogs, rabbits, and monkeys by partial obstruction of the common duct (18,39). Common duct stones have been seen in patients with congenital absence of the gallbladder (14). Multiple intrahepatic and extrahepatic ductal stones develop in patients in certain parts of the Orient (24,46), where stone formation seems to result from deconjugation of bilirubin diglucuronide by β-glucuronidase secreted by E. Coli (32).

Those who subscribe to the view that most common duct stones originate in the gallbladder treat all but a few patients (approximately 5%) with gallstone disease by cholecystectomy and cholecdocholithotomy. Those who consider common duct stones to be more often primary and a result of ampullary stenosis recommend that a drainage procedure be performed in a large proportion (approximately 50%) of patients requiring choledocholithotomy. They believe that choledocholithotomy alone would result in a high rate of recurrent stone formation, just as would cholecystolithotomy alone for gallbladder stone disease. Another reason sometimes cited for frequent use of a drainage procedure is that overlooked stones would be able to pass into the gut postoperatively.

The notion that a large percentage of stones are primary was given theoretical support in an article by Madden (30), who classified common duct stones as primary or secondary based on their morphology and the degree to which they resembled the stones found in the gallbladder. Primary common duct stones were ovoid, dark to light brown, and loosely compacted, having an "earthy" appearance. Secondary stones were faceted and brown, more firmly compacted, and in other ways looked like the stones found in the gallbladder. According to these criteria, the common duct stones in more than half of 107 patients were classified by Madden as primary and were presumably due to ampullary stenosis. Therefore, to avoid recurrent stone formation or to allow recurrent stones to escape from the duct, he recommended the liberal use of choledochoduodenostomy as an adjunct to choledocholithotomy. There are a number of other surgeons who concur with this philosophy and perform drainage procedures in a similarly large proportion of patients (38,43,47).

In addition to the gross appearance of common duct stones, the decision for a drainage procedure is based on the size of the orifice of the papilla of Vater (ampullary stenosis), the size of the duct, the results of common duct manometry, the number of stones removed from the duct, the presence of known residual stones, and the existence of uncorrectable lesions (eg, intrahepatic cysts or stenosis of the duct) likely to give rise to more stones in the future.