Adverse effects of barium sulfate in the biliary tract

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Reflux of orally administered barium sulfate preparations into the biliary tract is rare, but serious complications have been recorded. To consider the implications of such reflux through enterobiliary stents, the literature was reviewed. A case illustrating such an occurrence is presented. Based upon the limited literature available, barium suspension may be retained in particular circumstances and cause or contribute to stent occlusion.

Key words: • adverse effects • barium sulfate • biliary tract • reflux • stents

Case report

An 82-year-old male presented with painless jaundice and was found to have a 6.0 cm irregular stricture of the common bile duct, consistent with cholangiocarcinoma on imaging appearances (19). The stricture was traversed by percutaneous positioning of a 0.9 x 10.0 cm internally covered Wallstent® (Boston Scientific Ltd., St. Albans, UK) for long-term palliation. The patient then re-presented with clinical evidence of gastric outlet obstruction. A double-contrast barium meal examination (high density barium sulfate for suspension and effervescent granules, E-Z-EM Ltd., London, UK) did, however, not confirm this, showing duodenal distortion only. Nonetheless, there was instant reflux of contrast medium through the stent (Fig. a) and into several biliary radicles, notably those in the dependent portion of the right lobe of the liver (Fig.
Although reflux of air or barium sulfate preparations into the biliary tract is rare in those with normal sphincter of Oddi manometry (7), biliary stents breach the sphincter with the aim of creating a continually patent lumen. This facilitates reflux of duodenal contents, including partially digested food material. Reflux of barium-containing contrast media through biliary stents may therefore be anticipated during the postural manoeuvres involved in a barium meal examination.

Given a physiological bile production of approximately 0.65 dm³ per day (23), i.e. >0.025 dm³ per hour, one may expect that the bulk of refluxed material would promptly be washed back into the duodenum. However, the efficacy of such physiological clearance is uncertain, particularly if stent patency is suboptimal.

The commonest complication of biliary stenting is occlusion, recently reported in 31% of patients following Wallstent® insertion (22). Median patency in that study was less than 6 months, however, both the incidence of stent blockage and patency duration may be less (24). The risk of stent occlusion is primarily related to stent material and time in situ with duodenobiliary reflux of plant material being an important etiological factor (25, 26). Should reflux of barium sulfate occur through a partially occluded stent, drainage from the biliary tract may be delayed or incomplete with adverse sequelae, particularly cholangitis (16, 27), since the prolonged retention of barium in itself constitutes an important risk factor for complications (11). Furthermore, considering the possibil-

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**Figure. a-d.** Fluoroscopic images from upper gastrointestinal barium series. Distortion with lack of distension of the descending part of the duodenum and reflux of barium suspension through the stent (note that the stent is widely patent) is seen (a), and subsequent image (b) when filling of the biliary tree with contrast medium is apparent. Follow-up conventional abdominal radiographs at approximately 4 hours (c) and at 22 hours (d) demonstrate progressive clearance of barium suspension from the biliary tract.

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b). According to medical and nursing records, the patient remained asymptomatic; no rise in body temperature was evident, and biochemical liver function tests did not deteriorate. Serial abdominal radiographs demonstrated almost complete drainage of the barium preparation from the biliary tract with time (Fig. c, d).

**Discussion**

Most patients with malignant obstructive jaundice have inoperable disease at presentation (20). Although the prognosis is poor, biliary drainage by means of stent insertion offers effective palliation (19–21). The use of plastic and, more recently, expandable metallic stents has become well established for malignant and some cases of benign biliary tract obstruction (22).
ity of barium dehydration and impaction, barium suspension retained in already partially blocked stents could further promote stent occlusion.

We believe that, with the increasing use of biliary stents, reflux of barium sulfate preparations into the biliary tract will be observed more frequently during examinations of the upper gastrointestinal tract. In addition to the recognized complications of reflux, such as acute cholangitis, consideration should be given to the potential of accelerated stent occlusion, particularly if stent patency is already under question. Should reflux be observed, delayed radiographs and careful clinical monitoring are advised to confirm drainage. Alternative investigations or contrast media, i.e. iodinated, water-soluble agents, may be considered in those at greatest risk or in instances when adequate surveillance is deemed impracticable, e.g. in outpatients. Reports on adverse effects of reflux of barium sulfate through biliary stents should be encouraged to further evaluate the scale and importance of this potential complication.

References