

Is it necessary to insert a stent for laparoscopic biliary reconstruction?

–Examination of bile duct regeneration model using bioabsorbable material–



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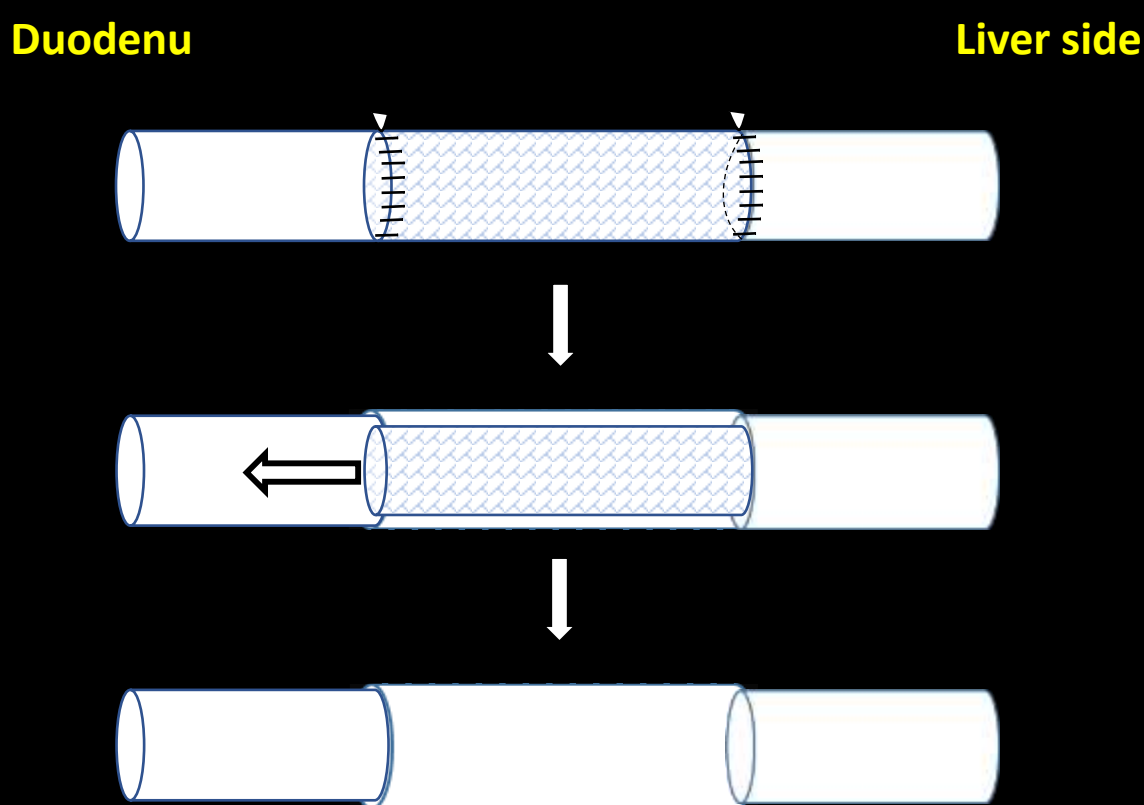
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Background and Aim

Laparoscopic biliary reconstruction, compared with open surgery, reports a **high frequency of biliary-intestinal anastomotic stenosis** postoperatively. Although the cause may be due to the difficulty of the elaborate suturing operation, it may be considered as another underlying cause that the biliary anastomotic stenosis process has not been sufficiently elucidated. In this study, we considered the above from the bile duct regeneration model using the artificial bile duct, and examined the role of stenting during laparoscopic biliary reconstruction.

In this study, we examined the necessary conditions to insert a stent into the anastomotic part of the digestive tract based on our research on a bile duct regeneration model using an artificial bile duct.

Bile duct regeneration process by artificial bile duct transplantation



The site of bile duct regeneration using this model is **the outside (peritoneum side)** of the artificial bile duct.

Results

	B-B Stenosis	B-D stenosis
A (n=3) (w/ stent)	0/3	0/3
B(n=3) (w/o stent)	2/3	0/3

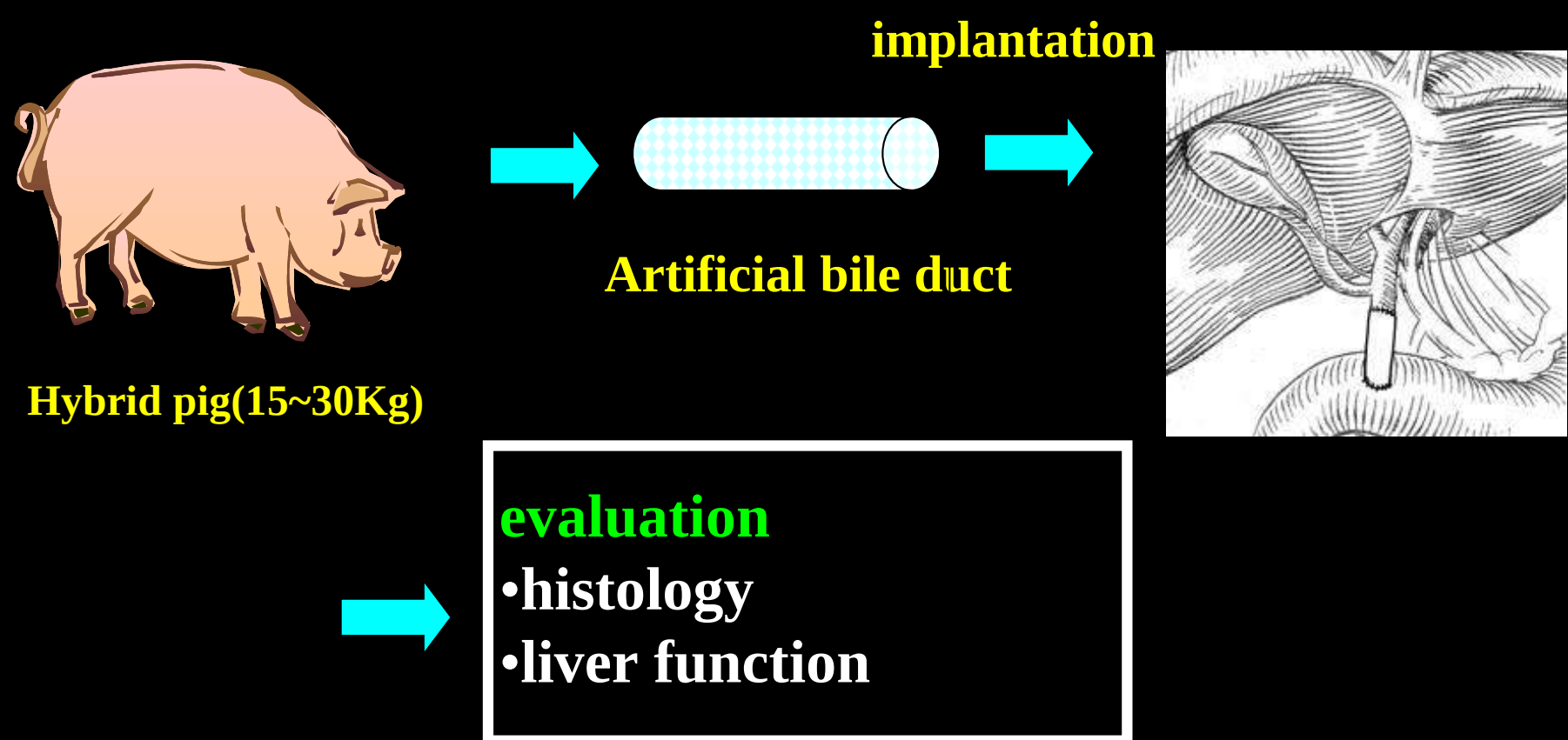
B-B: native bile duct-artificial bile duct, B-D: artificial bile duct- native duodenum

Group A (stent (+)) : No stenosis at the native bile duct-artificial bile duct anastomotic site was observed.

Group B (stent (-)) : Stenosis of the native bile duct-artificial bile duct anastomotic site was observed (2/3).

Materials and Methods

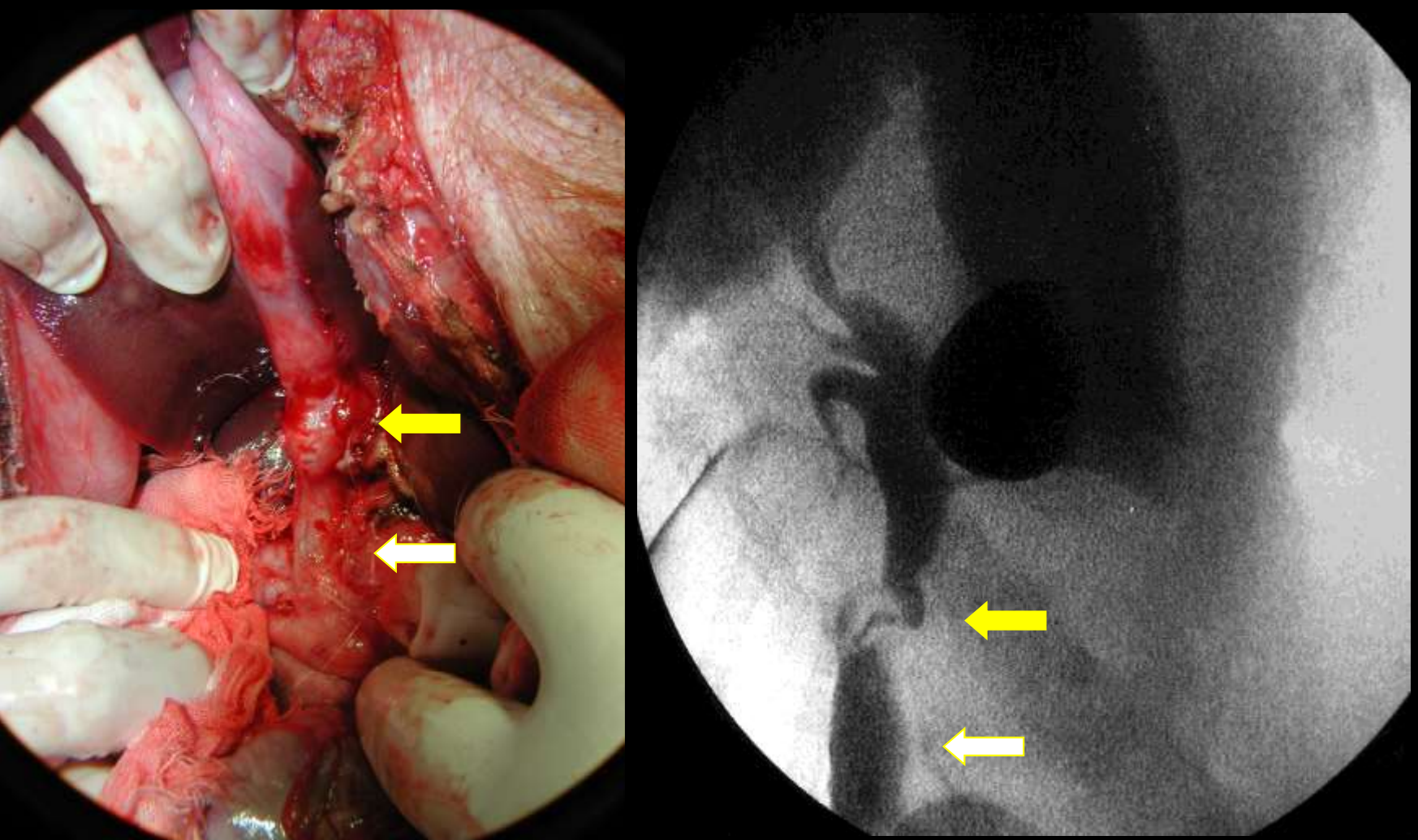
(biliary regeneration model (artificial bile duct))



The extrahepatic bile duct was replaced with a bioabsorbable polymer in pigs, and the graft site was histologically examined at selected time intervals.

Miyazawa M, et al. *Am J Transplant* 2005

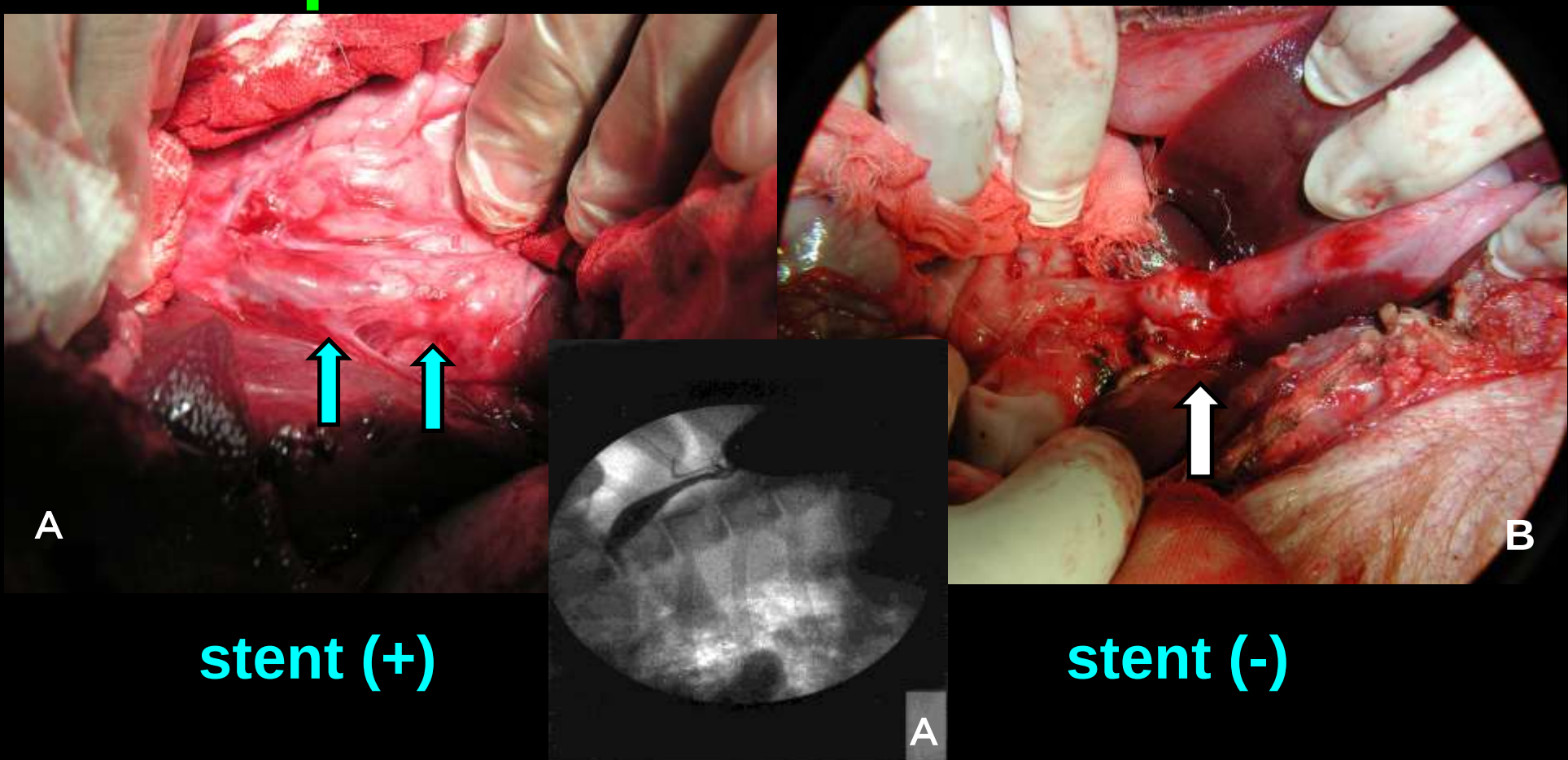
Neo-bile duct (6M after Tx)



Stenosis was observed at the anastomosis between the bioabsorbable polymer tube (artificial bile duct : ABD) and the native bile duct on the liver side (yellow arrow). No stenosis was observed at the anastomosis between the artificial bile duct and the duodenal bile duct.

Neo-bile duct (6M after Tx)

Compared w/ stent and w/o stent

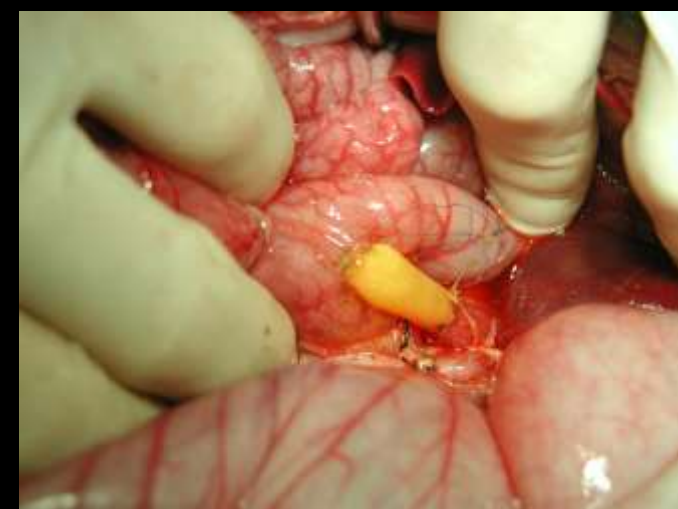


When a stent was placed in the hepatic bile duct-artificial bile duct anastomosis: no stenosis of the anastomosis was observed.

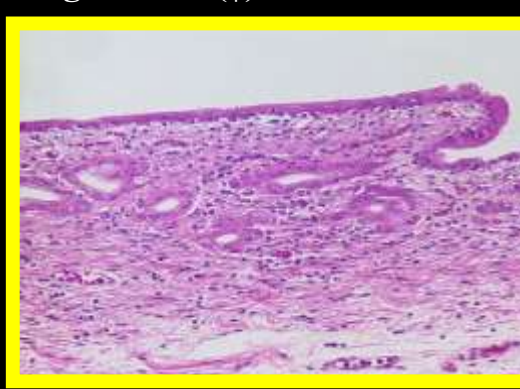
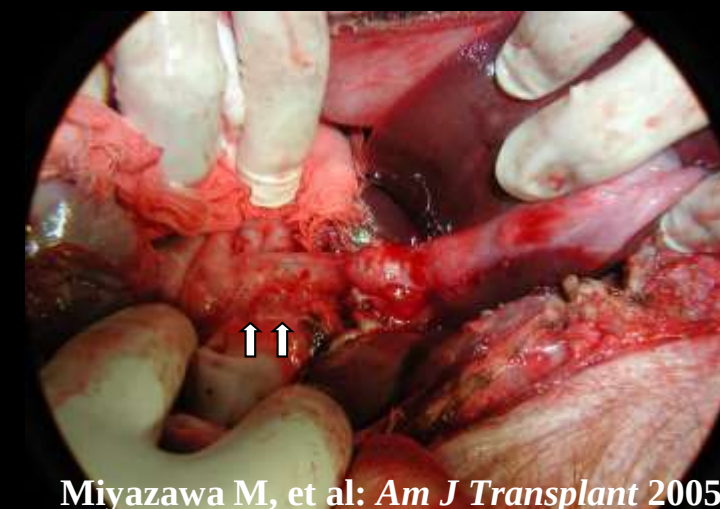
Reconstruction of the bile duct



The polymer is made of a copolymer of polycaprolactone and polylactic acid reinforced with polyglycolic acid fibers and designed to degrade inside the body in about 8 weeks and to have an air porosity of 95% or more. Thus, cells can penetrate it fairly well.



The photo 6 months after transplantation reveals the neo-bile duct similar to the native bile duct formed in the graft site (*). The site of anastomosis at the hepatic end is more or less thickened.



Neo-bile duct
Control (native bile duct)
Histological findings: The epithelium of the neo-bile duct got columnar 6 months after transplantation like the native bile duct. The submucosal layer contained more connective tissues than the control bile duct did. The accessory glands are observed under the epithelium.

Miyazawa M, Aikawa M, et al. *Am J Transplant*. 2005

Summary

(Miyazawa M, et al. *Am J Transplant* 2005)

- The site of bile duct regeneration using this model is **the outside (peritoneum side)** of the artificial bile duct.
- The bile ducts are regenerated **as in the form of artificial bile ducts**.

If a stent is inserted into the lumen of the artificial bile duct and the shape of the anastomotic part is retained, **will the anastomotic part not be narrowed?**

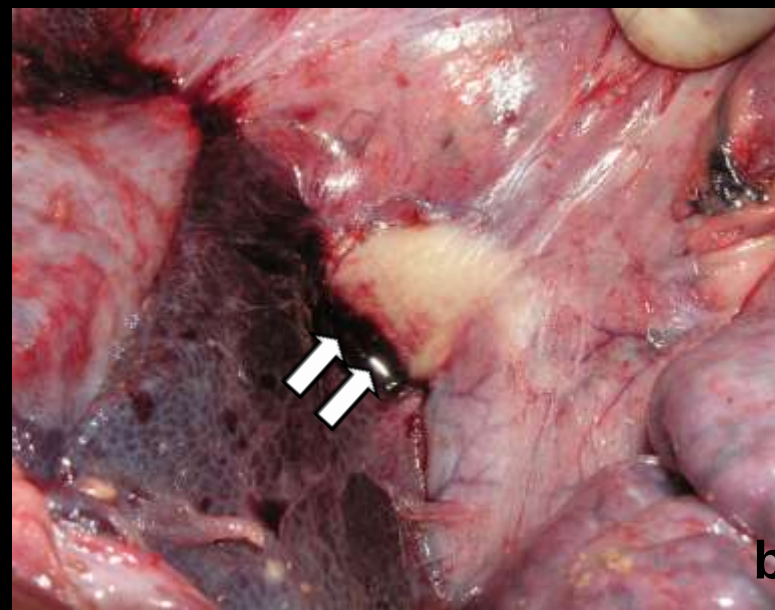
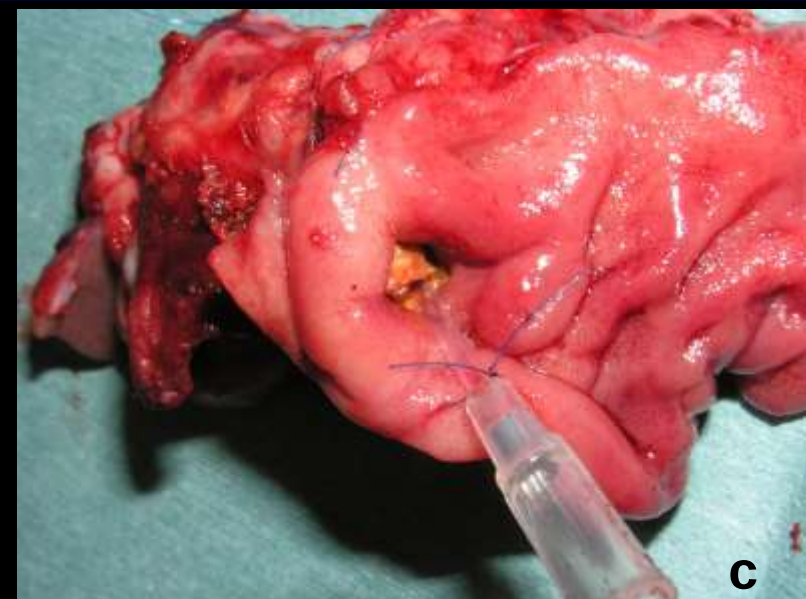
Results

- The transplanted pig survived until sacrifice at 3 months after transplantation.
- In both groups, **no stenosis** at the anastomotic site on **the duodenum side** was observed.

Group A (stent (+)) : No stenosis at the native bile duct-artificial bile duct anastomotic site was observed.

Group B (stent (-)) : Stenosis of the native bile duct-artificial bile duct anastomotic site was observed (2/3).

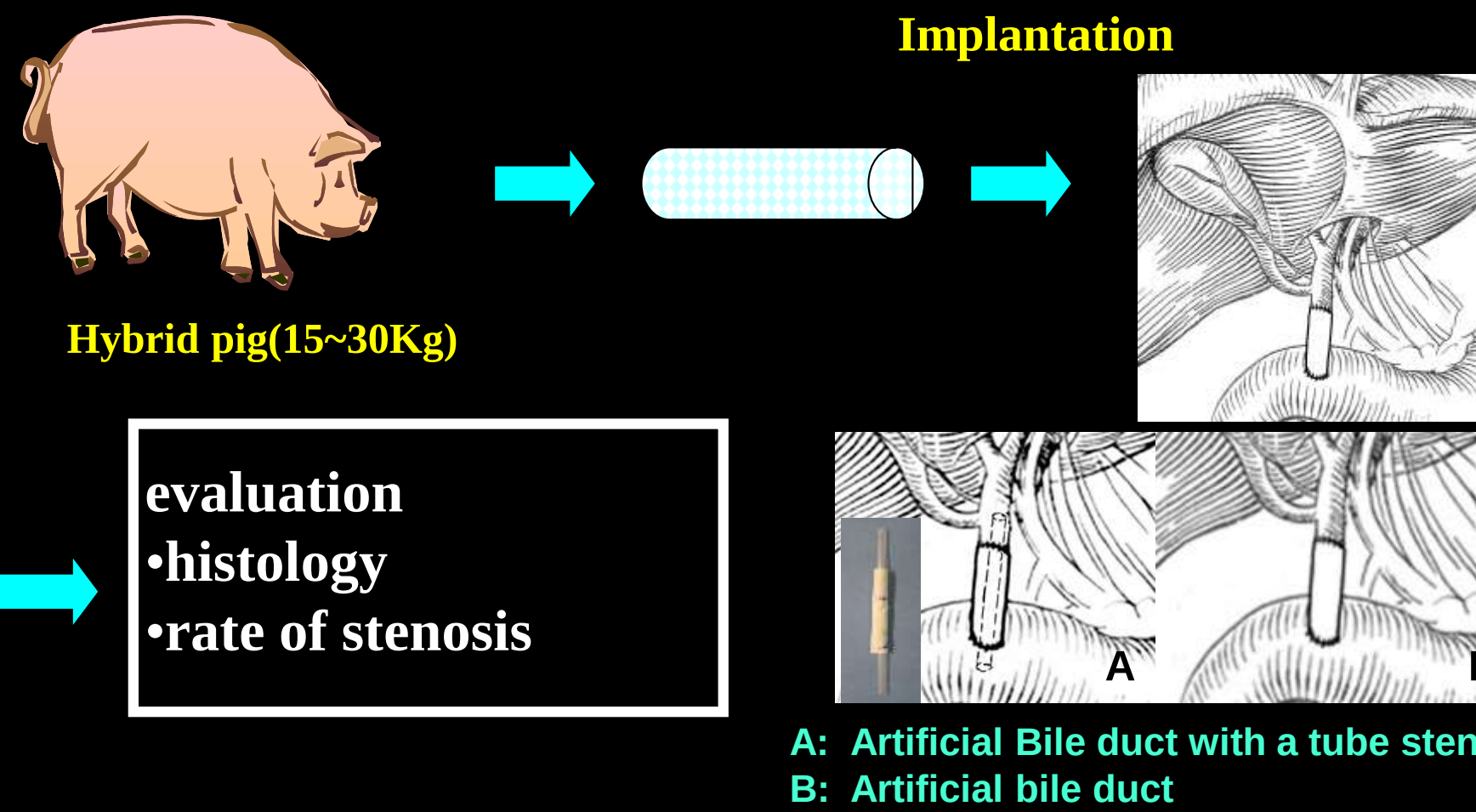
Implantation of an artificial bile duct 3W after Tx



Neo-bile duct 3 weeks after ABD implantation.
(a) The part that will be reproduced as a neo-bile duct is a dark purple part (black arrows), which is shown outside the ABD.
(b) Whitish tissue is observed in the area where the ABD was transplanted. (white arrows).
(c) The ABD, which weakened, was found when we observed the ABD from the b) duodenal side (black arrows).

Materials and Methods

—Evaluation of anastomotic site by the presence or absence of stent—



1) Biliary duct regeneration model (without stent): A bioabsorbable tube with a diameter of 5 mm and a major diameter of 3 cm (artificial bile duct: living absorption period 6-8 weeks) is implanted to bypass the extrahepatic bile duct and duodenum. The biliary tract similar to native was regenerated at the transplant site (*Am J Transplant* 2005).
2) (with stent) In 1), in most cases, no stenosis occurred in the bile duct-artery bile duct anastomosis but in rare cases the stenosis in the same anastomotic junction was recognized (artificial bile duct is relatively soft and anastomoses. We considered that the cause could not maintain the form of the department). Therefore, a stent was inserted so as to pass through the bile duct-artery bile duct anastomotic site, the shape of the anastomotic site was maintained, and it was examined whether or not the anastomotic stenosis could be prevented. 3) Histologically compared and examined the stenosis bile duct and non-stenosis bile duct.

Conclusions and discussions

- Maintaining the shape** of the biliary-biliary anastomosis is necessary to prevent biliary-biliary anastomotic stenosis.
- In order to maintain the shape of the biliary-biliary anastomosis, **a stent is required for 2 weeks or more** after the operation.
- If it is difficult to maintain the shape of the anastomotic site in **laparoscopic surgery or robotic surgery**, it is considered that a stent should be inserted.