Background:
Biliary complications such as biliary strictures, bile leaks, bile duct stones/casts, and ischemic biliary injury currently represent a major source of morbidity after living donor liver transplantation (LDLT). The incidence of biliary complications after LDLT is significantly higher than that after deceased donor liver transplantation. The reported incidence of biliary stricture is 5% to 15% following deceased donor liver transplantations and 28% to 32% following living donor liver transplantations. With advances in therapeutic and diagnostic endoscopy and interventional radiology, the non-operative management of biliary complications has become standard techniques as the preferred diagnostic and therapeutic modalities. Although endoscopic management is considered as the first-line treatment for biliary strictures, it may be challenging in LDLT recipients due to the complex nature of the duct-to-duct reconstruction. Percutaneous interventional approach might be an alternative strategy in these patients. In this study we aimed to present usage of pigtail drainage catheter as biliary stent for treatment of biliary stricture after LDLT.

Materials & Methods:
Twenty-seven patients with biliary stricture were treated with our novel technique. In this technique, an internal-external catheter was trimmed into three parts as proximal, mid, and distal portion. Distal trimming site was the tip of catheter. The proximal trimming site was adjusted based on the measurement of the relevant biliary tract length. A suture string was passed through distal hole of mid portion. Mid portion was reversed and used as stent, proximal portion was used as a pusher. Following balloon dilation of the stenotic segment, distal, reversed mid, and proximal portions were loaded over the guidewire. Suture string was used to retract the stent for favorable manipulation and placement at the desired site (Figure-1). After proper placement of the stent, retractor suture string, the pusher and guidewire were removed. The tip was dropped into the duodenum lumen during procedure. The stent was removed at 3rd or 4th month of placement through ERCP in all patients.

Results:
No significant complications developed during the procedure and follow-up period. Ten patients required re-stenting by ERCP at the same session. The mean follow-up period was two years. Cholestase enzymes and bilirubin levels were within normal limits in all patients during follow-up.

Conclusion:
Stent derived from drainage catheter facilitates treatment of biliary strictures in patients not eligible for the retrograde approach. This stent is cheap and easy to implement and can also be easily removed by ERCP and re-stenting can be applicable retrogradely if needed.

Figure 1. Manual modification of pigtail drainage catheter as Biliary stent. Pigtail biliary drainage catheter (Skater™ drainage system–Argon)(A). The catheter is trimmed to 3 proximal (3), mid (2) and distal (1) portions with scalpel blade (B,C). A suture string was passed through the hole of proximal segment of mid-portion (4) and the mid portion is reversed to be used as stent, proximal portion as pusher and the distal portion to facilitate stent advancement in biliary duct and to prevent injury of liver paranchyma and bile duct. Suture string is used to retract the stent for favorable placement at the desired site(C). The system is loaded over a hydrophlic guidewire (D).

Figure 2. A 68 year old male patient, live liver graft receiver (on 12.2016) developed biliary stricture at the anastomosis site 6 months after operation The Percutaneous Transhepatic Cholangiography revealed the stenosis site (B). The anastomotic site was passed with hydrophilic guidewire and manipulation catheter. The modified plastic stent was prepared according to biliary tree length based on formerly measured over fluoroscopy. The system was introduced to the biliary tree and was advanced to pass the ampulla water by help of the proximal portion of catheter (pusher) (C). The trimmed catheter tip facilitated catheter advancement and was dropped into duodenum lumen (D, red asterix). Proximal portion of the catheter and guidewire was retracted and the bending force of proximal portion of the stent provided maintenance of stent in biliary and prevented its downward migration (F). The stent was removed by ERCP 3 months later.