

Updates in Surgery

Umberto Cillo
Luciano De Carlis *Editors*

Liver Transplantation and Hepatobiliary Surgery

Interplay of Technical
and Theoretical Aspects



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Updates in Surgery



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Editors

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Aspects

Foreword by Paolo De Paolis

 Springer

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Foreword

It's really a pleasure for me to introduce this important work by Umberto Cillo, Luciano De Carlis, and coworkers, focusing on the interplay of technical and theoretical aspects of liver transplantation and hepatobiliary surgery.

Umberto and Luciano, leaders of the Italian surgical school and community, engaged distinguished experts in the field; the significant experience and scientific excellence of the contributors have produced a high-quality monograph.

This volume highlights all the important aspects of liver transplantation and hepatobiliary surgery, providing updates on hot topics in this area and regarding new techniques, not only related to surgery but also to liver and graft preservation from ischemic injury, and parenchymal regeneration. Many chapters describe the split liver technique, in its various forms, but always highlighting the deep interplay between transplant surgery and hepatobiliary surgery.

Particular attention is paid to young surgeons trained in a setting of liver and split liver transplantation; they'll certainly acquire relevant expertise to proceed in their learning path toward more complex liver resection procedures.

The high scientific level and the updating of the techniques make this volume valuable for the experienced surgeon and helpful for the less experienced surgeon, in order to understand the evolution of surgery in this field.

On behalf of the Italian Society of Surgery, I'd like to thank all the eminent authors who collaborated in producing this useful monograph.

Turin, Italy
September 2019

Paolo De Paolis
President
Italian Society of Surgery

Preface

The pages of this book are dedicated to all those young surgeons or experienced specialists who believe that surgery is a complex patchwork of different mental engrams originating from our multiform previous experiences, from our wide multidisciplinary knowledge, from the small details “captured” in the observations of others, from the psychologic attitude to approach difficulties, attitude that we derive from our personal character, strength, background, and history.

The Niguarda Hepatobiliary and Transplant Unit and the Padua Hepatobiliary and Liver Transplant Center have developed from a similar surgical matrix and history. In Padua a great tradition of general surgery descending from Ceccarelli and Cevese prompted Davide D’Amico to decide to embark on the liver transplantation enterprise. Belli in Milan put his extraordinary general surgery knowledge in the hands of young surgeons who, after attending the Galmarini and Fassati liver transplant experience, built the current Niguarda program.

Vittorio Staudacher represented a relevant *liaison* between our two realities. After graduating at the University of Padua in 1938, he developed there his first studies on lung and liver transplantation before following Guido Oselladore to Milan in 1950. He has been recently acknowledged in the *American Journal of Transplantation* (2012) as the first surgeon to report on an experimental orthotopic liver transplant in Western history in 1952.

In both our experiences at Niguarda and in Padua, transplant techniques remained deeply anchored to the concepts of general surgery, fully contaminated by the procedures of vascular and oncologic surgery, of massive organ debulking and abdominal reconstructive surgery typical of the 1970s and 1980s. In those years, hepatobiliary resective surgery, starting from few embryonic procedures, became increasingly practiced in our settings. Our frequent travels abroad (in the pre video-exchange era) allowed us to be deeply contaminated by the refined French, Japanese, and Korean liver transection techniques, which were (already at that time) totally devoted to the concepts of strict anatomical research of surgical planes and to the biodynamic study of the hepatic parenchyma in normal and diseased conditions.

The Niguarda and Padua Centers were among the very first to be involved in the extraordinary experience represented by the Italian split liver program in the context of the North Italy Transplant program (NITp), where ourselves and all our young surgeons had the extraordinary chance to be exposed to a complex resective surgery in the absence of preoperative anatomical planning.

Both centers were also the first in Italy to perform living donor-related liver transplantations, in a pediatric case in Padua in 1996 and in an adult case at Niguarda immediately after.

The advent of minimally invasive surgery from the 1990s onward was again among the areas of interest our two centers embraced early on, first in general surgery operations and then in the more complex videolaparoscopic and robotic liver resections. As a result, since the early 2000s surgical activities both in Niguarda and in Padua have been widely “blended,” including liver transplant as well as high volumes of open and minimally invasive hepatobiliary intervention mostly, but not exclusively, oriented to the oncologic area.

All these polyhedral surgical experiences have been crucial in developing an extremely flexible technical attitude enabling us to proceed in transplantation and hepatobiliary surgery with a myriad of overlapping concepts and practices.

The extensive overlap between these two (only initially distant) surgical worlds is the topic of the following pages.

Close to 70 years after the first described hepatic lobectomy by Lortat-Jacob in 1952, the continuous and rapid evolution of the surgical technique has improved the hemostatic control of the resected liver surface, and innovative methods of parenchymal dissection have allowed an enormous expansion of the number of indications and candidates. In the beginning, liver resection and liver transplantation were performed by different surgical teams with poor interplay with each other. However, the evolution of both liver resection and transplantation toward a more complex operation called for increasingly intense interaction between these surgical techniques. Therefore, split liver and living donor liver transplantation became popular in the transplant community that utilized the Couinaud segmental anatomy in a very sophisticated way. Portal and arterial resection and reconstruction became indispensable techniques to treat Klatskin tumor infiltrating the hepatic hilum. Ex-situ techniques for resection of tumor at the suprahepatic confluence with or without venous reconstruction and total vascular exclusion of the liver with the use of a venovenous bypass arose from the experimental area before transferring to clinical practice. The development of minimally invasive liver surgery changed the treatment options for HCC patients on a waiting list for liver transplantation, allowing for a lower degree of decompensation in cirrhotic patients after surgery and extending the surgical indications.

The aim of this book, under the auspices of the Italian Society of Surgery, is to offer a complete survey of the interplay between liver transplantation and hepatobiliary surgery through the contribution of many Italian and international experts.

This work also owes a tribute to all the pioneers and masters of hepatobiliary and liver transplantation surgery with particular reference to Henri Bismuth, Rudolf Pichlmayr, Roy Calne Koichi Tanaka, and, above all, Thomas Earl Starzl. They launched a clear message by indicating pathophysiology, deep anatomic awareness, and interdisciplinary cross-fertilization as crucial and indispensable tools for any sophisticated technical skill.

We aim to proceed along their path well aware that, day after day, this field of surgery astonishes our eyes, challenges our minds, and gratifies our hearts.

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Cross Training and Didactic Interplay in Liver Transplantation and Hepatobiliary Surgery

1

Quirino Lai and Massimo Rossi

1.1 Introduction

We need a system, and we shall surely have it, which will produce not only surgeons, but surgeons of the highest type, men who will stimulate the first youths of our country to study surgery and to devote their energies and their lives to raising the standard of surgical science—William Stewart Halsted (1904)

William Halsted's paradigm for surgical residency training is recognized as the most appropriate educational system to become a competent general surgeon. The length of training largely varies from a minimum of 4 years in countries such as West Africa and Brazil to 5 years in Italy, and at least 8 years in the UK and Hong Kong [1].

Hepatopancreatobiliary (HPB) and liver transplantation (LT) surgery are the cornerstones of general surgery training, because of their high prevalence and complexity. However, the recent evolution observed in these fields has transformed modern HPB surgery into a technically complex and technology-dependent procedure. Moreover, a rising number of HPB cases can be routinely performed using minimally invasive surgery (MIS), which has forced to move a number of cases out of residents' hands, placing them in the domain of specialist fellows or staff surgeons. This is particularly true in consideration of the increasing number of "disappearing" HPB procedures, such as open cholecystectomy, and explains why the new generations of resident graduates are concerned about their being unprepared for independence. Unfortunately, such a condition gives rise to a perverse mechanism in which many highly specialized surgeons finish their training and find a position either going back to general surgery or moving on to other specialization branches.

Q. Lai (✉) · M. Rossi

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