



The Current Status of Peritoneal Surface Oncology in Saudi Arabia

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Abstract

Peritoneal carcinomatosis (PC) is a common evolution of abdominal cancers. It may arise from the peritoneum itself (primary) or originate from another type of cancer especially those of gastrointestinal or gynecological origin (secondary). Without aggressive multimodal therapeutic approaches, PC is associated with a poor prognosis. Cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) have been used to treat PC since 1990. In Saudi Arabia, the first CRS and HIPEC were done in 2008. In 2018, Saudi Arabia population is 32 millions of people and the demand for such procedures has grown up. This article gives outlines of the current status of peritoneal surface oncology in Saudi Arabia and the future perspective.

Keywords Peritoneal metastasis · CRS · HIPEC · PIPAC

Introduction

Peritoneal carcinomatosis (PC) is a common evolution of abdominal cancers and is associated with a poor prognosis without aggressive multimodal therapeutic approaches [1]. Since its origin in the 1990s, cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) have been increasingly used as curative treatment for several etiologies of PC [2, 3]. CRS and HIPEC offer the best outcome for pseudomyxoma peritonei and peritoneal mesothelioma and represent the only actual curative treatment for colorectal and gastric PC [4–7].

The aim of this article is to give outlines of the current status of peritoneal surface oncology (PSO) in Saudi Arabia and the future perspective.

History of Peritoneal Surface Oncology in Saudi Arabia

Before 2008, all patients with PC in Saudi Arabia were considered for palliative management. At that time, a limited number of patients could ask for further treatment outside the country by applying for governmental support. On October 2008, two centers created the first PSO programs in Saudi Arabia with the objective to treat patients suffering from PC by CRS and HIPEC. They aimed to cover the entire population of Saudi Arabia, which was 25 millions of people at that time. In addition to national coverage, both centers included the possibility of treating patients in some neighboring countries. The first two CRS and HIPEC were done in different tertiary centers in November 2008, King Faisal Specialist Hospital and Research Center (KFSH&RC) and King Fahad Medical City (KFMC), by the pioneers Dr. Tariq Amin and Dr. Khalid Almohaimeed. In 2011, a new center in the holy city of Makkah started a program followed by two other centers in King Abdulaziz University and King Saud University in 2016 and 2017, respectively. Since 2008, the number of CRS and HIPEC procedures increased and reached a total of more than 1200 procedures in all Saudi centers so far. According to recent data (<https://www.stats.gov.sa/ar/indicators/1>), Saudi Arabia population is 32 millions of people and the demand for such procedures has grown up. Moreover,

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colorectal cancer is the most common cancer affecting Saudi males and the third most common in females. The lack of nationwide screening program and population education had also contributed to late and advanced presentation [8].

General Surgery Training Program in Saudi Arabia

The Saudi Board of General Surgery started in 1995 as one of the core training programs of the Saudi Commission for Health Specialties (SCFHS) (https://www.scfhs.org.sa/en/MESPS/TrainingProgs/Listgraduate_programs/Pages/default.aspx). The curriculum is a 5-year structured training program in general surgery. It encompasses education in basic sciences, training in cognitive and technical skills, development of clinical knowledge, and maturity and acquisition of surgical judgment. Resident evaluations and assessments throughout the program are carried out in accordance with SCFHS rules and regulations. This includes a yearly promotion exam in addition to the Saudi Board Examination (parts I and II) (https://www.scfhs.org.sa/en/MESPS/TrainingProgs/Listgraduate_programs/Pages/default.aspx). In Saudi Arabia, there are multiple high-quality fellowships such as colorectal or breast and endocrine, but to date there is no surgical oncology or peritoneal surface oncology fellowship. On the other hand, the Saudi government provides total financial support to the newly graduate student or resident that wants to apply for a residency or a fellowship program in another country especially in North America, Europe, Australia, and Asia. Regarding the training for CRS and HIPEC, all the surgical oncologists of Saudi Arabia have been trained for this procedure in high-volume hospital worldwide such as St George Hospital in Australia, Fox Chase Cancer Center in the USA, University of Montreal in Canada, and Lyon Sud University Hospital in France.

Health Care Structure in Saudi Arabia and Insurance Coverage for the Procedure

The health care system in the Kingdom of Saudi Arabia has improved rapidly over the recent years. It can be classified as a national health care system, led by the Saudi Ministry of Health (MOH), in which the government provides health care services through a number of government agencies. In the meantime, there is a growing role and increased participation from the private sector in providing health care services [9, 10]. Regarding CRS and HIPEC, the government provides full health coverage for all of the Saudi citizens in the MOH medical cities, university hospitals, and KFSH&RC. The estimated cost is ranging between 70,000 and 80,000 US dollars per procedure. For the non-Saudi citizens living or working in Saudi Arabia, they are subjected to have a private health insurance to

cover the cost of the procedure with some exception in the university hospital; this procedure could be offered for free.

Referral Pattern for CRS and HIPEC

Recently, the MOH in Saudi Arabia has established a new electronic referral system (EHALATI) (<http://ehalati.moh.gov.sa/Account/Login.aspx>). This program aims to share medical advice between doctors of various health facilities regarding the conditions of patients without moving them from one doctor to another. It also provides all the logistics and coordination needed to refer patients to another medical facility, along with the archiving system. Each tertiary hospital has an eligibility committee that will review the patient file and give a decision within 48 h. For patients with PC, one of the surgical or medical oncologists of the team will review the patient file and the patient will get an appointment in less than 2 weeks for further assessment and investigation. Furthermore, all patients will be reviewed in the weekly tumor board conference to establish an integrative health care plan until the surgical procedure.

Peritoneal Surface Malignancy Centers in Saudi Arabia

The first two CRS and HIPEC were done on October 2008 in two different tertiary centers, KFSH&RC and KFMC, by the pioneers Dr. Tariq Amin and Dr. Khalid Almohaimeed. After these first procedures, three other tertiary centers were open: King Abdullah Medical City (KAMC) in Makkah, King Abdulaziz University Hospital (KAUH) in Jeddah and King

Table 1 Surgeons' training and experience in Saudi Arabia

Surgeons' training and experience	No. of surgeons
Total number of surgeon performing HIPEC	15
Active consultant	14
Under training (fellowship)	1
Clinical specialty	
Surgical oncology	14
Gynecology oncology	1
Sex (M:F)	13:2
Years of experience (in surgical oncology)	
< 10 years	10
> 10 years	5
Country of HIPEC training	
Australia	8
Canada	3
France	1
The USA	2

Table 2 HIPEC centers in Saudi Arabia

Hospital name	No. of surgeons	No. of bed capacity	No. of HIPEC	Year of 1st HIPEC
KFSH&RC (Riyadh)	4	1200	450	2008
KFMC (Riyadh)	3	1100	420	2008
KAMC (Makkah)	3	450	370	2011
KAUH (Jeddah)	3	800	5	2016
KKUH (Riyadh)	1	760	25	2017

KFSH&RC King Faisal Specialist Hospital and Research Center, *KFMC* King Fahad Medical City, *KAMC*, King Abdullah Medical City, *KAUH* King Abdulaziz University Hospital, *KKUH* King Khalid University Hospital

Khalid University Hospital (KKUH) in Riyadh. Currently, there are 14 active trained surgeons doing this procedure nationally and one currently in training at St George Hospital, Australia. Bed capacity, average number of patients per years, total number of patients operated, and number of surgeons per center are summarized in Tables 1 and 2.

Eligibility for CRS and HIPEC is usually determined during multidisciplinary conference involving medical and surgical oncologists, radiologists, anesthesiologists, and pathologists of each center. All centers performing CRS employ a team of surgeons, anesthesiologists, and nurses specifically trained in this procedure. In addition, this type of procedure cannot be done without the approval of the multidisciplinary conference of each center.

Regarding research and collaboration in the field of PSO, all the Saudi surgeons were active for research and publication during their training; some of them are still in collaboration with international working group. Unfortunately, there is still no published national multicenter collaboration. On the other hand, Dr. Amin from KFSH&RC and his group have published multiple single-center studies in the field of CRS and HIPEC.

Future of Peritoneal Surface Malignancy in Saudi Arabia

Peritoneal surface oncology is an emerging specialty in Saudi Arabia. While the first CRS and HIPEC were done in 2008, it attracts more and more of young surgeons now. The Saudi group of surgical oncologists includes a homogenous mix of expert surgeons and motivated young surgical oncologists. In the near future, there is a plan to establish PSO working group with the aim to share experience and promote research in this field. Saudi society of surgical oncology will be created in the near future. Regarding the training needed for CRS and HIPEC, there is a plan to start a PSO fellowship including training in CRS and HIPEC and pressurized intraperitoneal aerosol chemotherapy (PIPAC). This will be a 1-year fellowship and it will be opened only for surgeons who are already certified in colorectal, upper GI, hepato-biliary, or gynecologic oncology.

During 2018, two scientific meetings about PSO were held in Jeddah (west of the country) led by King Abdullah Medical City and the Saudi Society of General Surgery, respectively. There was an active participation from local surgical oncologists and from international experts such as Pr David Morris from Australia, Pr Olivier Glehen from France, and Dr. Sanjay S. Reddy from the USA. During these meetings, future plans for research and collaboration were discussed. Finally, we hope to organize a PSOGI (peritoneal surface oncology group international) meeting in Saudi Arabia in the near future. For that to happen, we need to work hard and start more local and international collaborations.

Summary The Saudi Arabia Peritoneal Surface Oncology Group needs more centers and more trained surgeons to cover for the rising demand. The next challenge will be to start the PC registry and start collaborative project between centers.

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