We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,300

Open access books available

172,000

International authors and editors

190M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities

WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com

The Role of the Surgeon in Multidisciplinary Approach to Gastrointestinal Stromal Tumors

Selim Sözen¹, Ömer Topuz² and
Yasemin Benderli Cihan³

¹Adana Numune Training And Research Hospital General Surgery Department, Adana

²Kayseri Training And Research Hospital General Surgery Department, Kayseri

³Kayseri Training And Research Hospital Radiation Oncology Department, Kayseri
Turkey

1. Introduction

Gastrointestinal stromal tumours (GISTs) are the most common mesenchymal neoplasms of the digestive tract with an estimated annual incidence of 10–20 cases per one million inhabitants (H. Joensuu et al;2002, B. Nilsson, et al; 2005). GISTs probably arise from precursor cells of the interstitial cells of Cajal. Their defining characteristic is a gain-of-function mutation in genes coding for the KIT tyrosine kinase receptor, which is considered the driving force of cell proliferation in this tumour(Y. Shinomura et al;2005) Gastrointestinal stromal tumors usually appear in patients above 50 years of age, whereas the maximum incidence is observed in the 5th and the 6th decade of life. The mean age at the diagnosis is 55–63 years(Tran T et al; 2005). It is very rare in children and affects males and females equally. GIST is mainly a disease of the GI tract, mesentery, and omentum. Most commonly, it originates in the stomach (60%), followed by the small intestine (30%), the colon and rectum (5%), and the oesophagus (5%) (Van Der Zwan SM, et al;2005). Fletcher et al. proposed a classification of aggressive behaviour for GISTs based on their maximum diameter and mitotic rate(C. D. M. Fletcher et al;2002). factors which were both shown to predict recurrence and survival(S. Singer et al;2002, R. P. DeMatteo et al;2000). GIST can present in many ways. Thirty percent are diagnosed incidentally on a pathological or autopsy resection specimen(B. Nilsson, et al; 2005). Small tumors may be asymptomatic and GISTs can grow to a large size before producing any symptoms. Most symptomatic patients present with tumours larger than 5 cm in maximal dimension. Symptoms at presentation may include abdominal pain, abdominal mass, nausea, vomiting, anorexia, and weight loss. The vast majority of metastatic GISTs are located intraabdominal, either in the liver, in the omentum, or in the peritoneal cavity(C. D. M. Fletcher et al;2002). Metastatic spread to lymph nodes and to other regions via lymphatics is very rare. Most of the patients with GIST are symptomatic and bleeding due to mucosal ulceration is the most common symptom(Gold JS et al ; 2006). Mitotic count and tumor size have been shown to be very important. A large study examined 1765 tumors for prognostic markers(Miettinen et al; 2005). Tumours less than 10 cm with less than 5

mitoses per 50 high powered fields (HPFs) had only a 2%–3% risk of metastases. Conversely, the metastatic rate for tumors greater than 10 cm, with greater than 5 mitoses per 50 HPFs, was as high as 86%. Non-gastric primary tumor location and male gender may also be independent adverse prognostic factors (Rutkowski et al; 2007). Fletcher et al. proposed a classification of aggressive behaviour for GISTs based on their maximum diameter and mitotic rate (C. D. M. Fletcher et al; 2002), factors which were both shown to predict recurrence and survival (S. Singer et al; 2002, R. P. DeMatteo et al; 2000). Surgery remains the standard initial management for all localized GIST. The tumor should be removed en bloc, with a clear margin. The pseudocapsule should be removed and not penetrated. Therefore, a wedge resection (stomach) or segmental resection (intestine) is required. If neighboring structures are involved, en-bloc resection should still be contemplated. It is mandatory that the resection achieves negative margins verified by intraoperative frozen section examination, since the presence of residual disease negatively influences survival (S. Singer et al; 2002). The 5-year survival rate after surgery amounts to 28–65% (Debol SM et al; 2001, Blay JY et al; 2005). It is not necessary to resect the regional lymph nodes during the operation, because gastrointestinal stromal tumors do not metastasize to the regional lymphatic system.

2. Surgery

Primary GIST may occur anywhere along the GI tract from the esophagus to the anus (Judson I et al; 2002). The most frequent site is the stomach (55%), followed by the duodenum and small intestine (30%), esophagus (5%), rectum (5%), colon (2%), and rare other locations.

2.1 Treatment of the non-metastatic disease approach to the primary lesion (stomach)

The radical surgical treatment is the most effective treatment option for GIST. The 5-year survival rate after surgery amounts to 28–65% (R. P. DeMatteo et al; 2000). It is not necessary to resect the regional lymph nodes during the operation, because gastrointestinal stromal tumors do not metastasize to the regional lymphatic system. Lymphatic metastasis rarely occurs (0–3.4%) in patients with GIST (Tashiro T et al; 2005). It is mandatory that the resection achieves negative margins verified by intraoperative frozen section examination, since the presence of residual disease negatively influences survival (S. Singer et al; 2002). More recently, there has been a move to laparoscopic surgery, particularly for gastric GIST. One series of 50 consecutive patients showed this approach was associated with low morbidity and short hospitalization. All resections had clear margins and the long term disease free survival was 92% (Novitsky YW et al; 2006). Current recommendation is that laparoscopy should be restricted to the treatment of small lesions (up to 5 cm) due to the possibility of tumor rupture as a result of the manipulation of larger lesions (Guitierrez JC et al; 2007). Current NCCN guidelines do not contain a clear statement on whether surgery for GIST should be performed laparoscopically or through open surgery but recommend that surgery should produce minimal surgical morbidity (National Comprehensive Cancer Network (NCCN); 2008). Recently, a new technique of endoscopic full-thickness resection using a flexible stapler was described. This approach seems particularly useful in tumours of the posterior distal part of the stomach (G. Kaehler et al; 2006).

2.2 Treatment of the non-metastatic disease approach to the primary lesion (small intestine, duodenum and esophageal GISTs)

GISTs of the small intestine with histopathologic features including mitotic counts $>5/50$ HPF, high cellularity, absence of a predominant organoid growth pattern, absence of skeinoid fibers, presence of severe nuclear pleomorphism, presence of mucosal infiltration, and tumor cell necrosis have been significantly associated with an adverse outcome in the literature (Tworedk JA et al; 1997, Chang MS et al;1998). The treatment of choice is the complete resection of the tumour.(Figure 2) With regard to local invasion and tumor perforation, a tumor that has invaded a contiguous organ is considered to be advanced and associated with poor outcome(Shiu MH et al;1982, Ng EH et al;1992). Local invasion and tumor perforation were associated with poor DFS; although all gross disease was removed, these conditions were similar to those that occur with incomplete resections. Unlike therapy of mucosa and submucosa derived duodenum tumor, pancreas or duodenum resection is not required in therapy of duodenal stromal tumor which is tumorectomy. Unique treatment option of duodenal GIST is not Pancreatico-duodenectomy. Pancreas preserving segmental duodenum resection may be useful, comfortable and safe especially for the third

Fig. 1. Intraoperative picture showing tumour and Meckel's diverticulum.
(Archived by SELİM SÖZEN)

Fig. 2. The well-circumscribed lesion of the ileum before its removal.
(Archived by SELİM SÖZEN)

part GIST of duodenum. Esophageal tumors are usually small and asymptomatic, larger lesions present with dysphagia, and sometimes they may be found accidentally, as an abnormal mediastinal shadow on chest X-ray. Relevant literature reports only a few cases of these kinds of tumors, some treated with esophageal resection and others treated with enucleation (Spinelli GP et al;2008).

Fig. 3. Histopathology slide after Immunostaining for C-Kit; Tumour cells show positivity after C-Kit staining, which suggests GIST. (Archived by SELİM SÖZEN)

3. Small intestine

The clinical presentation is variable and depends on tumor size and anatomic site. Their submucosal location can produce local obstructive symptoms, particularly when arising in the oesophagus or the small intestine. Vague upper abdominal pain, fullness, GI bleeding, palpable mass are other modes of presentation whereas sometimes they are found incidentally during barium studies, endoscopy or abdominal scans performed for other reasons (Roberto Logrono et al;2004). According to some authors, visceral obstruction is a rare occurrence even in the presence of extensive peritoneal metastatic disease (Burkill GJC et al;2003). Although the diagnostic procedure includes several examinations, such as barium examination of the gastrointestinal track, computer tomography and angiography (Fang SH et al;2004), none of them can establish the correct diagnosis with 100% certainty. The preoperative percutaneous fine needle aspiration of the tumor for diagnostic purpose is not indicated because of the danger for potential intraperitoneal migration or tumor rupture (Fang SH et al;2004). Recently, several studies pointed out the significance of endoscopic ultrasound-guided fine-needle aspiration for the diagnosis of GIST with a reported accuracy of 89% (Eloubeidi MA, et al;2004). On the other hand, positron-emission tomography (PET) with 18F-fluoro-2-deoxy-D-glucose is a very useful tool for the postoperative follow-up of patients receiving imatinib (Gelibter A et al;2004). The treatment of choice for GISTs is the surgical excision of the tumor. All tumors must be completely resected (R0 resection), where possible, including the tissues that are infiltrated, while systemic lymph node dissection is not recommended by many authors (Chen TW et al; 2005, Aparicio T et al;2004). Complete surgical resection is connected with 48-65% five-year survival. Partial resection must only be performed in case of large tumors, for palliative purposes or for the control of symptoms or complications such as compression of other

organs, hemorrhage, or pain(Connolly EM et al;2003). The clinical presentations of GISTs of small bowel are variable and depend on the tumor size and anatomic site. In the review of Miettinen and Lasota(Miettinen M et al;2006) the most common presentation of GIST is reported as GI bleeding. The tumors smaller than 2 cm in size are generally asymptomatic and larger tumors may present with upper abdominal pain, palpable intra abdominal mass, vomiting, weight loss, and perforation or rupture. Computed tomography or magnetic resonance investigation is useful in tumors larger than 2 centimeters(Lupescu IG et al;2007, Spivach A et al;1999, Abbas M et al;2008). Endoscopic examinations fail in the diagnosis of GISTs originated from the small intestine. The long term survival is 50% at best. These tumors are believed to be potentially malignant lesions with an average rate of 20–25% of gastric and 40–50% of small intestinal localization. Metastases commonly develop in the abdominal cavity and liver; rarely, in bones, soft tissues, and skin (Abbas M et al;2008,Bucher P et al;2006, Miettinen M et al;2006). Prognostic factors for GISTs are the age, anatomic location, mitotic rate, and tumor size(Bucher P et al;2006, Efremidou EI et al;2006). Chemotherapy and radiotherapy do not increase the survival time. Radiotherapy is indicated in intraperitoneal hemorrhage and maintaining analgesia in unresectable tumors. Imatinib, a selective inhibitor of tyrosinekinases, is a hope promising drug, which is the first effective treatment for non-resectable or metastatic GISTs. Furthermore, imatinib is indicated in intraperitoneal perforated or ruptured GIST due to the possibility of peritoneal soiling (Efremidou EI et al;2006, Karagülle E et al;2008).

4. Duodenum

Duodenal GIST usually present with vague abdominal pain(50%–70%) or they bleed into the lumen(20%–50%)(Sturgeon C et al;2003, DeMatteo RP et al;2000). Second part of the duodenum seems to be the common site of duodenal GIST and most of them will require pancreatoduodenectomy for complete resection(Winfield et al;2006). Completely resected GIST has a five year survival of 30%–80%(Casper ES; 2000). Incompletely resected tumors have a high recurrence rate(upto 90%). Historically Unresectable/metastatic GIST has a median survival of 12 months(Roberts PJ et al;2002). Imatinib mesylate, a specific tyrosine kinase inhibitor has produced a paradigm shift in the treatment of GIST, due to the targeted molecular therapy. Imatinib produce sustained clinical response in more than 50% of the patients with advanced GIST and one year survival in these patients was 88%(Demetri GD et al;2002). Surgery with negative surgical margins and no tumor rupture is a necessary and adequate means of treating such tumors. Extensive lymph node dissection is unnecessary, because GISTs rarely metastasize to the regional lymph nodes(Pidhorechly I et al;2000, Emory TS et al;1999, DeMatteo RP et al;2000, Pieri JPEN et al;2001). When technically feasible, this makes duodenal resection preferable to pancreatoduodenectomy(Uehara K et al;2001). However, the optimal surgical treatment for duodenal GISTs has never been fully assessed. Recent anatomical knowledge of the head of the pancreas(Sakamoto Y et al;2000) has facilitated various methods of pancreatic resection for low-grade malignancies (52,53,54 Nakagohri T et al;2000, Thayer SP et al;2002, Sakamoto Y et al; 2002), and duodenal resection preserving the pancreatic head can now be performed safely.

5. Colon and rectum

GISTs are an extremely rare subset of colonic tumors that are difficult to distinguish grossly from the commonly encountered adenocarcinoma. GISTs are found commonly in the

stomach (60 – 70%) and small intestine (20 – 30%), and rarely in the colon and rectum (5 – 10%) and esophagus (less than 5%).(Graadt van Roggen JF et al;2001). When in a colonic location, about two thirds of these GISTs occur in the left or transverse colon(57 Miettinen M et al;2000) . These tumours predominantly occur in middle aged or older persons, the median age at presentation being sixty years, and are uncommon below forty years of age(Graadt van Roggen JF et al;2001, Mukhopadhyay S et al;2002). Males and females are affected equally, but a peculiar subset occurs in female patients below the age of 21 years, either singly or in association with pulmonary chondromas and extra-adrenal paraganglionomas (Carney's syndrome)(Graadt van Roggen JF et al;2001). Grossly, GISTs may vary greatly in size. Smaller tumours (2 cm or less) are usually asymptomatic and are usually detected incidentally during investigations or at surgery for unrelated pathology. These often exhibit a benign nature, but at times, may present with metastasis to the liver and lungs(DeMatteo RP et al; 2000). Larger tumours usually behave like malignant tumors, and may present with abdominal pain and gastrointestinal bleeding due to ulceration of the overlying mucosa, abdominal mass, or with nonspecific symptoms such as weight loss, vomiting, fever and anemia. Depending on the site, the tumor may also present with obstruction, dysphagia, altered bowel habits, or rarely, obstructive jaundice(Burkill GJC et al;2003, Ludwig DJ et al;1997). Complete gross excision of the tumor is the treatment of choice; routine lymph node excision is not recommended since they are rarely involved. However, it must be stressed here that in the absence of a clear cut diagnosis of colonic GIST, surgery must proceed as if for adenocarcinoma and radical clearance should be done. Care must be taken to avoid tumour rupture during surgery, since this has been implicated as one of the causes of recurrence(Mukhopadhyay S et al;2002, DeMatteo RP et al; 2000). Colorectal GISTs are relatively rare, frequency being reported at approximately 5%(Miettinen M et al;2000).Moreover, the pathobiological features of malignant GISTs of the colon remain unclear. Most rectal tumours are of epithelial origin. Only a small number of rectal tumours originate from the smooth muscle cells in the rectal wall. Such stromal tumours are either benign (leiomyoma) or show malignant characteristics (formerly known as leiomyosarcoma), and may have a submucosal, subserosal or intraluminal location(Dufresne AC et al; 1999, Buckley JA et al;1998). Malignant stromal tumour of the rectum represents 0.5% of all rectal tumours and 7% of gastrointestinal stromal tumours (GIST)(Wolf O et al;1994, Randleman CD Jr et al;1989). Macroscopically the tumour originates from the muscularis propria of the rectum, and the mucosa generally remains intact. Microscopic findings consist of a proliferation of spindle cells arranged in fascicles(Dufresne AC et al;1999). On endorectal ultrasound, a GIST is seen as a hypoechoic, heterogeneous polycyclical mass, which at high resolution ultrasound imaging is shown to originate from the muscularis propria(Dufresne AC et al; 1999, Marcy PY et al;1993). Endorectal ultrasound is very helpful in defining the extent of disease(Hsieh JS et al;1999). CT appearances of GIST located in the rectum do not differ from those in other parts of the digestive tract. On nonenhanced CT, a GIST presents as a well delineated, lobulated, homogeneous soft tissue mass with low attenuation and sometimes with calcification(Buckley JA et al;1998, Pannu HK et al; 1999). Although GIST confined to the rectal wall can be treated by local excision(Cailliez-Tomasi JP et al;1999), the prognosis of GIST of the rectum is poor and the 5-year survival rate ranges from 22% to 66% for high grade malignant and low grade malignant types, respectively(Witzigmann H et al;1995). Tumours with mitotic counts higher than 5 per 10 high power fields, and a size larger than 10 cm have an especially significant risk of recurrence(Miettinen M et al,1998).

GIST's of the rectum are most often clinically silent. Symptoms are not specific but highly size-related : the tumors ranged from small asymptomatic intramural nodules to larger masses that bulge into the pelvis, causing compressive symptoms (pain, constipation, occlusion), or rectal bleeding (sudden or occult) together with anemia and urinary symptoms(LI C. F et al;2005). Endoscopy shows a sub-mucosal mass bulging under a normal or ulcerated mucosae. Per-endoscopic guided biopsies can be performed but remained negative in more than 50% of cases(BLAY J. Y et al;2005). Ultra-sonic endoscopy may revealed a hypoechogenic circular lesion with clear edges. Percutaneous needle biopsies have been suggested to be helpful in the diagnosis but may expose to a non-negligible haemorrhage risk and a possible peritoneal diffusion of the tumor(BLAY J. Y et al; 2005).

Timing for surgery is still controversial, although some authors have published indications for surgery(CHANGCHIEN C. R et al;2004): lesions including malignant criteria (Group I), lesions less than 3 cm long with irregular edges and heterogenicity at echoendoscopy screening (Group II). If patients are at high operative risk, periodic biopsies and observation are mandatory. Lesions without malignant criteria (Group III) require echoendoscopy observation every 6 months. lymph node metastasis is considered an infrequent event in the natural evolution of these tumor. Although a limited lymphadenectomy is considered to be the procedure of choice. In this instance, a total mesorectum excision (TME), as strongly recommended for adenocarcinoma, is not mandatory for the resection of rectal GIST. More, extended lymph node dissection doesn't contribute to the improvement of survival(APARICIO T et al;2004).

6. Esophageal GISTs

The presenting signs and symptoms of esophageal GIST depend on the size and location of the tumor. Typically, they cause dysphagia, suggesting the possibility of carcinoma(Miettinen M et al;2000). Less commonly they are detected as large mediastinal masses involving the esophagus. Other manifestations include cough, gastrointestinal bleeding, and weight loss. Occasionally, it may be an incidental finding. There is little information in the literature describing the radiologic appearance of esophageal GISTs. In Miettinen's series, esophageal GISTs ranged from 2.6 to 25 cm in size and were most commonly located in the distal third of the esophagus . This was a distal esophageal mass that distorted and widened the esophageal lumen on barium esophagram(Miettinen M et al;2000). Although complete surgical resection is the standard treatment for localized resectable GISTs, the optimum extent of resection has not been determined. Surgery for esophageal tumors is either enucleation or esophagectomy,with the latter having a higher morbidity rate. Enucleation with clear dissection is sufficient for small-sized,well-capsulated tumors confined to the esophageal muscle layer, without mucosal lesions. Preoperative biopsy and esophagectomy, however, should be considered for larger tumors or tumors accompanied by mucosal lesions. Clear resection margins are also important. In performing enucleation, we shelled out the tumor carefully. with Endo Peanut (U.S. Surgical, Norwalk, CT). And rather than assessing margin status, we determined whether the tumor capsule was maintained in intact condition, as well as confirming mucosal integrity, by intraoperative endoscopic examination. During esophagectomy the external lateral margin as well as the proximal and distal resection margins was confirmed by pathologic examination. Although small intestinal and gastric GISTs may be resected with segmental or

wedge resections, esophageal GIST resections are essentially limited to either simple enucleation or esophagectomy. Successful surgical treatment of GISTs depends on complete local resection. The approach to esophagectomy for GISTs should minimize blunt or blind dissection as this will not reliably include maintaining the thin potential barrier of pleura that may overlie extramucosal tumor. Additionally, poor tumor integrity and lack of esophageal serosa increase the risk of tumor rupture with blunt dissection. Transhiatal esophagectomy would likely violate tumors of the distal and midesophagus that extend beyond the muscularis and cannot be recommended. A transthoracic en bloc resection of the pleura overlying the esophagus and any involved surrounding tissues, including diaphragm, is advisable to avoid microscopically or macroscopically incomplete resection. A left thoracoabdominal approach is advocated for larger tumors at the gastroesophageal junction as this will allow excellent visualization of the paraesophageal tissue. Management guidelines for GISTs have been defined by consensus of the National Comprehensive Cancer Network (NCCN) and the European Society of Medical Oncology (Demetri GD et al;2006, Blay JY et al;2005). The NCCN guidelines state that enucleation of small (≤ 2 cm) esophageal GIST may be acceptable and that small intraabdominal tumors might be resected laparoscopically.

6.1 Treatment of the non-metastatic disease approach to the primary lesion (extra gastrointestinal tumors and Meckel's diverticulum)

GIST also occur in the extra-intestinal abdominopelvic sites such as the omentum, mesentery, or retroperitoneum. A small number may originate not from the omentum, but from outside the gastrointestinal tract; these are designated extra-GISTs (EGISTs) (Reith JD et al;2000). The reported cases of extra-gastrointestinal stromal tumors (EGIST) have included omental, mesenteric, and retroperitoneal tumors. The cellular origin of GIST from the interstitial cell of Cajal (ICC) raises the question of whether these EGIST are truly an entity analogous to GISTs. It is not well known if extra-gastrointestinal stromal tumors (EGIST) originate from pacemaker cells outside of the GI tract or if mesenchymal cells have the ability to recapitulate the phenotype. Sakurai *et al.* (Sakurai S et al;2001), published their results on the cytological, immunohistochemical, and genetic analysis of 5 omental mesenchymal tumors in 2001. They found all five tumors to be positive for CD117 and CD34 staining, while all were negative for smooth-muscle cell markers. More importantly, the authors reported finding KIT immunoreactive CD117 and CD34 cells within specimens of omentum (Sakurai S et al;2001). These findings and those of Yamamoto *et al.* (Yamamoto H et al;2004) underscore the fact that histologically, EGISTs have a similar appearance to GISTs, and that EGIST is a distinctive entity, different from leiomyosarcomas (Miettinen M et al;1999). The most common mutation of the KIT gene occurred in exon 11 in Sakurai's and Yamamoto's experience (Sakurai S et al;2001, Yamamoto H et al;2004).

GIST arising from Meckel's diverticulum are extremely rare (Johnston AT et al;2001). (Figure 1,3). The tumors are infrequent and observed only in 0.5–3.2% of the Meckel's diverticula. Of these, 12% tumors are GIST. Radiological appearances of GIST may include asymmetrical thickening of the bowel wall initially, but more commonly an exophytic soft tissue mass with relatively well defined margins is seen (Macari M et al;2001). Areas of necrosis are present in up to 70% of tumours (Nicola's AI et al;1999) and particularly in larger tumours that frequently undergo central necrosis, due to rapid growth, and subsequent ischaemia (Macari M et al;2001). These also demonstrate heterogeneous contrast enhancement (Macari

M et al; 2001). Areas of calcification and haemorrhage are seen within 7% and 64% of tumours, respectively(Nicola's AI et al;1999).Surgical resection is the treatment of choice for these tumors, which usually have a poor prognosis. Extragastrointestinal stromal tumors arising in the pancreas are extremely rare. A primary localization in the pancreas has rarely been reported on cytology. The clinical symptoms include abdominal pain, early satiety, flatulence, ileus, bleeding, anemia, and weight loss. It can be diagnosed incidentally by radiologic imaging(Miettinen M;2001). There was a distinct female predominance, age ranging from 38 to 72 years including all surgical pathological cases (mean age 55 years). The majority occurred in the body and tail of the pancreas with an average size of 12 cm(Miettinen M;2001). Extraintestinal gastrointestinal stromal tumors (EGISTs) are uncommon and unique neoplasms, usually involving the mesentery, omentum, retroperitoneum, rarely bladder(Nagase S et al;2007) and inguinal hernial sac. EGISTs arising in the rectovaginal septum and presenting as a recurrent vaginal mass is unusual. The current definitive treatment for EGIST is surgical resection, but in majority of the patients, the tumors recur despite complete resection(Dematteo RP et al;2000). An accurate diagnosis is mandatory for EGIST as these are tumors with an aggressive course and a potential for recurrence inspite of complete surgical excision. In addition, the treatment strategy includes kit tyrosine inhibitor, Imatinib which is used for recurrent and advanced disease.

6.2 Treatment of the metastatic and relapsed disease

GISTs have a high risk of metastatic relapse. The usual site of recurrence is the liver (65%), the peritoneal surface (50%) and both (20%). GIST's response to conventional chemotherapy is very poor (<10%), while radiotherapy is only used for analgesic purposes or in cases of intra peritoneal hemorrhage (Gupta P et al; 2008). Surgery has limited efficacy in the treatment of recurrent and metastatic GIST. In the past years, there has been no efficient method to cure recurrent GIST. GIST is also resistant to both chemotherapy and radiotherapy. The development of imatinib has improved the management of GIST. Even though imatinib is effective for most patients with a metastatic GIST, the development of resistance to the drug is a problem that has been increasing(Heinrich MC;2006). Based on the satisfied result for advanced GIST, surgery combined with imatinib adjuvant therapy may give a hope for the patients with high-risk GISTs. A prospective multicenter trial in high-risk patients after complete gross resection of the tumor revealed that imatinib 400 mg daily can reduce the risk of recurrence and metastasis(Zhan WH et al;2006). Based on the satisfied result for advanced GIST, surgery combined with imatinib adjuvant therapy may give a hope for the patients with high-risk GISTs(Zhan WH et al;2006). Although there are several reports of combination therapy of imatinib with surgery for the advanced GIST with metastases, most of the studies used imatinib eoadjuvantly, and the surgery was performed after the reduction of tumor burden by imatinib therapy. For tumours with a larger diameter and/or unfavourable location, primary wedge resection is often not possible and total or subtotal gastrectomy would be required for resection with tumour-free margins. For these cases, the NCCN guidelines(National Comprehensive Cancer Network (NCCN);2008) and ESMO recommendations(P. G. Casali et al;2008) suggest neoadjuvant imatinib therapy to decrease tumour size, thus fallowing for organ-preserving surgery.

7. Laparoscopic resection

The latest ESMO Clinical Recommendations consider a laparoscopic approach “if cancer surgery principles are respected.” (P. G. Casali et al;2008). Current NCCN guidelines do not contain a clear statement on whether surgery for GIST should be performed laparoscopically or through open surgery but recommend that surgery should produce minimal surgical morbidity(National Comprehensive Cancer Network (NCCN);2008). Current recommendation(Guitierrez JC et al;2007) is that laparoscopy should be restricted to the treatment of small lesions (up to 5 cm) due to the possibility of tumor rupture as a result of the manipulation of larger lesions(Guitierrez JC et al;2007). Although oncologic success has been reported with laparoscopic resections(Catena F et al;2008), studies with a larger number of cases and long-term follow-up are required in order to define the actual role of laparoscopy in the treatment of this neoplasm. Laparoscopic surgery as the new “gold standard” in the treatment of localised GISTs of the stomach, it would be highly desirable to have results from one or several randomised controlled trials(S. Sauerland et al;1999). As in other laparoscopic procedures, the existence of a “learning curve” must be assumed and it can be expected that operation times further decrease with growing experience(S.Avital et al;2006, M. Lim et al;2006, R. B. Shin et al,2005).

8. Conclusion

Although rare among tumors involving the gastrointestinal system, gastrointestinal stromal tumors are the most frequent mesenchymal tumors. Recommended treatment regimens need to be updated as the multidisciplinary approach to both diagnosis and treatment of the tumor gains importance. Surgery still holds place as the most important constituent of multidisciplinary in current algorithms and ongoing studies. The introduction of imatinib in clinical practice(Joensuu H et al;2001). changed not only the survival of metastatic GIST patients, but also meant breaking through well established paradigms. Nevertheless, despite the advances and the encouraging outcomes with the use of imatinib, the surgeon still has a key role in the management of GIST(Linhares E et al;2006).

9. References

- [1] Abbas M, Farouk Y, Nasr MM, Elsebae MM, Farag A, Akl MM, et al. Gastrointestinal stromal tumors (GISTs): clinical presentation, diagnosis, surgical treatment and its outcome. *J Egypt Soc Parasitol* 2008;38:883-894.
- [2] Aparicio T, Boige V, Sabourin JC et al. Prognostic factors after surgery of primary resectable gastrointestinal stromal tumors. *Eur J Surg Oncol* 2004;30:1098-1103.
- [3] S. Avital, H. Hermon, R. Greenberg, E. Karin, and Y. Skornick, “Learning curve in laparoscopic colorectal surgery: our first 100 patients,” *Israel Medical Association Journal*, vol. 8, no. 10, pp. 683–686, 2006.
- [4] B. Nilsson, P. B’umming, J. M. Meis-Kindblom, et al., “Gastrointestinal stromal tumors: the incidence, prevalence, clinical course, and prognostication in the preimatinib mesylate era—a population-based study in western Sweden,” *Cancer*, vol. 103, no. 4, pp. 821–829, 2005.

- [5] Blay JY, Bonvalot S, Casali P, et al. Consensus, meeting for the management of gastrointestinal stromal tumors: report of the GIST consensus, conference of 20-21 March 2004, under the auspices of ESMO. *Ann Onc* 2005;16:566-78.
- [6] Bucher P, Egger JF, Gervaz P, Ris F, Weintraub D, Villiger P, et al. An audit of surgical management of gastrointestinal stromal tumours (GIST). *Eur J Surg Oncol* 2006;32:310-314.
- [7] Buckley JA, Fishman EK. CT evaluation of small bowel neoplasms: spectrum of disease. *Radiographics* 1998;18:379-92.
- [8] Burkill GJC, Badran M, Thomas JM, Judson IR, Fisher C, Moskovic EC. Malignant Gastrointestinal Stromal Tumour: Distribution, Imaging Features, and Pattern of Metastatic Spread. *Radiology* 2003;226:527-32.
- [9] P. G. Casali, L. Jost, P. Reichardt, M. Schlemmer, and J.- Y. Blay, "Gastrointestinal stromal tumors: ESMO clinical recommendations for diagnosis, treatment and follow-up," *Annals of Oncology*, vol. 19, supplement 2, pp. ii35-ii38, 2008.
- [10] Casper ES: Gastrointestinal stromal tumors. *Curr Treat Options Oncol* 2000, 1:267-273
- [11] Cailliez-Tomasi JP, Bouche O, Avisse C, Ramaholimihaso F, Diebold MD, Flament JB. Leiomyosarcome du rectum. Quatre nouvelles observations. *Gastroenterol Clin Biol* 1999;23:523-7.
- [12] Catena F, Battista M, Fusaroli P, Ansaloni L, Scioscio V, Santini D et al. Laparoscopic treatment of gastric GIST: report of 21 cases and literature's review. *J Gastrointestin Surg.* 2008; 12(3):561-8. Epub 2007 Nov 27.
- [13] CHANGCHIEN C. R., WU M. C., TASI W. S., CHIANG J. M., CHEN J. S., HUANG S. F., YEY C. Y. Evaluation of prognosis for the malignant rectal gastrointestinal stromal tumor by clinical parameters and immunohistochemical staining. *Dis Colon Rectum*, 2004 Nov, 47 (11) : 1922-9.
- [14] Chang MS, Choe G, Kim WH, Kim YI: Small intestinal stromal tumors: a clinicopathologic study of 31 tumors. *Pathol Int* 1998, 48:341-347.
- [15] Chen TW, Liu HD, Shyu RY et al. Giant malignant gastrointestinal stromal tumors: recurrence and effects of treatment with STI-571. *World J Gastroenterol* 2005;11:260-263.
- [16] Connolly EM, Gaffney E, Reynolds JV. Gastrointestinal stromal tumors. *Br J Surg* 2003;90:1178-1186.
- [17] Debol SM, Stanley MW, Mallery JS. Can fine needle aspiration cytology adequately diagnose and predict the behavior of gastrointestinal stromal tumors? *Adv Anat Pathol.* 2001; 8: 93-97.
- [18] DeMatteo RP, Lewis JJ, Leung D, Mudan SS, Woodruff JM, Brennan MF: Two hundred gastrointestinal stromal tumors: recurrence patterns and prognostic factors for survival. *Ann Surg* 2000, 231:51-58.
- [19] Demetri GD, Baker LH, Benjamin R, et al. DNCCN, soft tissue sarcoma. Clinical practice guidelines in oncology. National Comprehensive Cancer Network; 2006.v.3.
- [20] Demetri GD, von Mehren M, Blanke CD, Abbeele AD, Eisenberg B, Roberts PJ, Heinrich MC, Tuveson DA, Singer S, Janicek M, Fletcher JA, Silverman SG, Silberman SL, Capdeville R, Kiese B, Peng B, Dimitrijevic S, Druker BJ, Corless C, Fletcher CD, Joensuu H: Efficacy and safety of imatinib mesylate in advanced gastrointestinal stromal tumors. *N Engl J Med* 2002, 347:472-80.

- [21] Dufresne AC, Brocheriou-Spelle I, Boudiaf M, Soyer Ph, Pelage JP, Rymer R. Tumeur stromale maligne rectale (leiomyosarcome): aspects echoendoscopique, tomodensitometrique et correlation anatomopathologique. *J Radiol* 1999;80: 303-5.
- [22] Efremidou EI, Liratzopoulos N, Papageorgiou MS, Romanidis K. Perforated GIST of the small intestine as a rare cause of acute abdomen: Surgical treatment and adjuvant therapy. Case report. *J Gastrointest Liver Dis* 2006;15:297-299.
- [23] Emory TS, Sobin LH, Lukes L, Lee DH, O'Leary TJ. Prognosis of gastrointestinal smooth-muscle (stromal) tumors. Dependence on anatomic site. *Am J Surg Pathol* 1999;23:82-7.
- [24] C. D. M. Fletcher, J. J. Berman, C. Corless, et al., "Diagnosis of gastrointestinal stromal tumors: a consensus approach," *Human Pathology*, vol. 33, no. 5, pp. 459-465, 2002.
- [25] Fang SH, Dong DJ, Zhang SZ, Jin M. Angiographic findings of gastrointestinal stromal tumor. *World J Gastroenterol* 2004;10:2905-2907.
- [26] Gupta P, Tewari M, Shulka H: Gastrointestinal stromal tumor. *Surg Oncol* 2008, 17(2):129-138.
- [27] Gelibter A, Milella M, Ceribelli A et al. PET scanning evaluation of response to imatinib mesylate therapy in gastrointestinal stromal tumor (GIST) patients. *Anticancer Res* 2004;24:3147- 3151.
- [28] Gold JS, De Matteo RP: Combined surgical and molecular therapy: the gastrointestinal stromal tumor model. *Annals of Surgery* 2006, 244:176-184.
- [29] Graadt van Roggen JF, van Veithuysen MLF, Hogendoorn PCW. The histopathological differential diagnosis of gastrointestinal tumors. *J Clin Pathol* 2001;54:96-102.
- [30] Guitierrez JC, Oliveira LO, Perez EA, Rocha-Lima C, Livingstone AS, Koniaris LG. Optimizing diagnosis, staging, and management of gastrointestinal stromal tumors. *J Am Coll Surg*. 2007; 205(3):479-91 (Quiz 524). Epub 2007 Jul 16.
- [31] Heinrich MC. Molecular basis for treatment of gastrointestinal stromal tumours. *Eur J Cancer*. 2006; 4(3 Suppl 1):S10-8.
- [32] Hsieh JS, Huang CJ, Wang JY, Huang TJ. Benefits of endorectal ultrasound for management of smooth-muscle tumor of the rectum: report of three cases. *Dis Colon Rectum* 1999;42:1085-8.
- [33] Joensuu H, Roberts PJ, Sarlomo-Rikala M, Anderson LC, Tervahartiala P, Tuveson D, et al. Effect of tyrosine kinase inhibitor STI571 in a patient with a metastatic gastrointestinal stromal tumor. *N Engl J Med*. 2001; 344(14):1052-6.
- [34] Johnston AT, Khan A, Bleakney R, Keenan RA: Stromal tumor within a Meckel's diverticulum: CT and ultrasound findings. *Br J Radiol* 2001, 74:1142-1144.
- [35] H. Joensuu, C. Fletcher, S. Dimitrijevic, S. Silberman, P. Roberts, and G. Demetri, "Management of malignant gastrointestinal stromal tumours," *The Lancet Oncology*, vol. 3, no. 11, pp. 655-664, 2002.
- [36] G. Kaehler, R. Grobholz, C. Langner, K. Suchan, and S. Post, "A new technique of endoscopic full-thickness resection using a flexible stapler," *Endoscopy*, vol. 38, no. 1, pp. 86-89, 2006.
- [37] Karagülle E, Türk E, Yildirim E, Göktürk HS, Kiyici H, Moray G. Multifocal intestinal stromal tumors with jejunal perforation and intra-abdominal abscess: report of a case. *Turk J Gastroenterol* 2008;19:264-267.

- [38] LI C. F., CHUANG S. S., LU C. L., LIN C. N. Gastrointestinal stromal tumor (GIST) in southern Taiwan : a clinicopathologic study of 93 resected cases. *Pathol Res Pract*, 2005, 201 (1) : 1-9.
- [39] M. Lim, C. J. O'Boyle, C. M. S. Royston, and P. C. Sedman, "Day case laparoscopic herniorrhaphy: a NICE procedure with a long learning curve," *Surgical Endoscopy*, vol. 20, no. 9, pp. 1453-1459, 2006.
- [40] Linhares E, Valadão M. Atualização em GIST. *Rev Col Bras Cir*. 2006; 33(1):51-4.
- [41] Ludwig DJ, Traverso W. GI stromal tumors and their clinical behaviour. *Am J Surg* 1997;173:390-4.
- [42] Macari M, Balthazar EJ. CT of bowel wall thickening: significance and pitfalls of interpretation. *AJR* 2001;176:1105-16.
- [43] Marcy PY, Francois E, Bruneton JN, Peroux JL, Balu-Maestro C, Melia P, et al. Leiomyosarcome gastrique, echoendoscopie et IRM. *J Radiol* 1993; 74:583-8.
- [44] Miettinen et al 2005 Miettinen M, Sobin LH, Lasota J. 2005. Gastrointestinal stromal tumors of the stomach: a clinicopathologic, immunohistochemical, and molecular genetic study of 1765 cases with long-term follow-up. *Am J Surg Pathol*, 29:52-68.
- [45] Miettinen M, Lasota J. Gastrointestinal stromal tumors: pathology and prognosis at different sites. *Semin Diagn Pathol* 2006;23:70-83.
- [46] Miettinen M, Monihan JM, Sarlomo-Rikala M, Kovatich AJ, Carr NJ, Emory TS, Sobin LH: Gastrointestinal stromal tumors/smooth muscle tumors (GISTs) primary in the omentum and mesentery: clinicopathologic and immunohistochemical study of 26 cases. *Am J Surg Pathol* 1999, 23:1109-1118.
- [47] Miettinen M, Sarlomo-Rikala M, Sobin LH, Lasota J. Gastrointestinal stromal tumors and leiomyosarcomas in the colon. *Am J Surg Pathol* 2000;24:1339-52.
- [48] Miettinen M, Sarlomo-Rikala M, Sobin LH, Lasota J. Esophageal stromal tumors: a clinicopathologic, immunohistochemical, and molecular genetic study of 17 cases and comparison with esophageal leiomyomas and leiomyosarcomas. *Am J Surg Pathol* 2000; 24: 211-222.
- [49] Miettinen M, Sarlomo-Rikala M, Lasota J. Gastrointestinal stromal tumours. *Ann Chir Gynaecol* 1998;87:278-81.
- [50] Miettinen M. Are desmoid tumors kit positive? *Am J Surg Pathol* 2001; 25:549-50.
- [51] Mukhopadhyay S, Gupta SD. Gastrointestinal Stromal Tumours : Bench-to-bedside review. *GI Surgery Annual* 2002;9:101-48.
- [52] Nagase S, Mikami Y, Moriya T, Niikura H, Yoshinaga K, Takano T. Vaginal tumors with histologic and immunocytochemical feature of gastrointestinal stromal tumor: two cases and review of the literature. *Int J Gynecol Cancer*. 2007 Jul-Aug; 17(4): 928-33.
- [53] National Comprehensive Cancer Network (NCCN), "Practice Guidelines in Oncology, v.2.2008," 2008.
- [54] Nakagohri T, Kenmochi T, Kainuma O, Tokoro Y, Kobayashi S, Asano T. Inferior head resection of the pancreas for intraductal papillary mucinous tumors. *Am J Surg* 2000;179:482-4.
- [55] Nicola's AI, Elduayen B, Vivas I, Paniz A, Martinez SHY, Cuesta A, et al. Radiological appearances of gastrointestinal stromal tumours. In: *European Congress of Radiology*; 1999 March7-12; Vienna, Austria. *European Congress of Radiology*, 1999.

- [56] Novitsky YW, Kercher KW, Sing RF, et al. 2006. Long-term outcomes of laparoscopic resection of gastric gastrointestinal stromal tumors. *Ann Surg*, 243:738-45; discussion 745-7.
- [57] Ng EH, Pollock RE, Munsell MF, Atkinson EN, Romsdahl MM: Prognostic factors influencing survival in gastrointestinal leiomyosarcoma Implications for surgical management and staging. *Ann Surg* 1992, 215:68-77.
- [58] Pannu HK, Hruban R, Fishman EK. CT of gastric leiomyosarcoma: patterns of involvement. *AJR* 1999;173:369-73.
- [59] Pidhorechly I, Cheney RT, Lraybill WG, Gibbs JF. Gastrointestinal stromal tumors: Current diagnosis, biologic behavior, and management. *Ann Surg Oncol* 2000;7:705-12.
- [60] Pieri JPEN, Choudry U, Muzikansky A, Yeap BY, Souba WW, Ott MJ. The effect of surgery and grade on outcome of gastrointestinal stromal tumors. *Arch Surg* 2001;136:383-9.
- [61] Randleman CD Jr, Wolff BG, Dozois RR, Spencer RJ, Weiland LH, Ilstrup DM. Leiomyosarcoma of the rectum and anus: a series of 22 cases. *Int J Colorectal Dis* 1989;4:91-6.
- [62] Reith JD, Goldblum JR, Lyles RH, Weiss SW: Extragastrointestinal (soft tissue) stromal tumors: an analysis of 48 cases with emphasis on histologic predictors of outcome. *Mod Pathol* 2000,13((5)):577-585.
- [63] Roberto Logrono , Dennie Jones V, Sohaib Faruqi , Manoop Bhutani S: Recent advances in cell biology, diagnosis and therapy of gastrointestinal stromal tumor (GIST). *Cancer Biology and Therapy* 2004, 33:251-258.
- [64] Roberts PJ, Eisenberg B: Clinical presentation of gastrointestinal stromal tumors and treatment of operable disease. *Eur J Cancer* 2002, 38:S37-38.
- [65] Rutkowski et al 2007 Rutkowski P, Nowecki ZI, Michej W, et al. 2007. Risk criteria and prognostic factors for predicting recurrences after resection of primary gastrointestinal stromal tumor. *Ann Surg Oncol*, 14:2018-27.
- [66] S. Sauerland, R. Lefering, and E. A. M. Neugebauer, "The pros and cons of evidence-based surgery," *Langenbeck's Archives of Surgery*, vol. 384, no. 5, pp. 423-431, 1999.
- [67] S. Singer, B. P. Rubin, M. L. Lux, et al., "Prognostic value of KIT mutation type, mitotic activity, and histologic subtype in gastrointestinal stromal tumors," *Journal of Clinical Oncology*, vol. 20, no. 18, pp. 3898-3905, 2002.
- [68] R. B. Shin, "Evaluation of the learning curve for laparoscopic Roux-en-Y gastric bypass surgery," *Surgery for Obesity and Related Diseases*, vol. 1, no. 2, pp. 91-94, 2005.
- [69] Shiu MH, Farr GH, Papchristou DN, Hajdu SI: Myosarcoma of the stomach: nature history, prognostic factors and management. *Cancer* 1982, 49:177-187.
- [70] Spinelli GP, Miele E, Tomao F, Rossi L, Pasciuti G, Zullo A, Zoratto F, Nunnari J, Pisanelli GC, Tomao S. The synchronous occurrence of squamous cell carcinoma and gastrointestinal stromal tumor (GIST) at esophageal site. *World J Surg Oncol* 2008; 6: 116.
- [71] Spivach A, Zanconati F, Bonifacio Gori D, Pellegrino M, Sinconi A. Stromal tumors of the small intestine (GIST). Prognostic differences based on clinical, morphological and immunophenotypic features. *Minerva Chir.* 1999;54:717-724.

- [72] Sakamoto Y, Nagai M, Tanaka N, Nobori M, Tsukamoto T, Nokubi M, et al. Anatomical segmentectomy of the head of the pancreas along the embryologically fusion-plane: A feasible procedure? *Surgery* 2000;128: 822-31.
- [73] Sakamoto Y, Tanaka N, Nagai M, Nobori M, Otani T, Makuuchi M. Anterior segmentectomy of the pancreatic head for islet cell tumors. *Pancreas* 2002;24:317-9.
- [74] Sakurai S, Hishima T, Takazawa Y, Sano T, Nakajima T, Saito K, Morinaga S, Fukayama M: Gastrointestinal stromal tumors and KIT-positive mesenchymal cells in the omentum. *Pathol Int* 2001, 51:524-531.
- [75] Sturgeon C, Chejfec G, Espat NJ: Gastrointestinal stromal tumors: a spectrum of disease. *Surg Oncol* 2003, 12:21-26.
- [76] Tashiro T, Hasegawa T, Omatsu M, Sekine S, Shimoda T, Katai H:Gastrointestinal stromal tumor of the stomach showing lymph node metastases. *Histopathology* 2005, 47:438-439.
- [77] Thayer SP, Fernandez-del Castillo C, Balcom JH, Warshaw AL. Complete dorsal pancreatectomy with preservation of the ventral pancreas: a new surgical technique. *Surgery* 2002;131:577-80.
- [78] Tran T, Davila JA, El-Serag HB. The epidemiology of malignant gastrointestinal stromal tumors: an analysis of 1,458 cases from 1992 to 2000. *Am J Gastroenterol*. 2005; 100: 162-168.
- [79] Tworedk JA, Appelman HD, Singleton TP, Greenson JK: Stromal tumors of the jejunum and ileum. *Mod Pathol* 1997, 10:200-209.
- [80] Uehara K, Hasegawa H, Ogiso S, Sakamoto E, Shibahara H, Igami T, et al. Gastrointestinal stromal tumor of the duodenum: Diagnosis and treatment. *Geka* 2001;63:1058-61 (in Japanese).
- [81] Van Der Zwan SM, Dematteo RP. 2005. Gastrointestinal stromal tumor: 5 years later. *Cancer*, 104:1781-8.
- [82] Vander Noot MR 3rd, Eloubeidi MA, Chen VK et al. Diagnosis of gastrointestinal tract lesions by endoscopic ultrasound-guided fine-needle aspiration biopsy. *Cancer* 2004;102:157-163.
- [83] Winfield , Robert D, Hochwald , Steven N, Vogel , Stephen B, Hemming , Alan W, Liu , Chen , Cance , William G, Grobmyer , Stephen R: *American Surgeon*. 2006, 72:719-23.
- [84] Witzigmann H, Sagasser J, Leipprandt E, Witte J. Leiomyosarcoma of the rectum. *Zentralbl Chir* 1995;120:69-72.
- [85] Wolf O, Glaser F, Kuntz C, Lehnert T. Endorectal ultrasound and leiomyosarcoma of the rectum. *Clin Investig* 1994;72:381-4.
- [86] Yamamoto H, Oda Y, Kawaguchi K, Nakamura N, Takahira T, Tamiya S, Saito T, Oshiro Y, Ohta M, Yao T, Tsuneyoshi M: c-kit and PDGFRA mutations in extragastrointestinal stromal tumor (gastrointestinal stromal tumor of the soft tissue). *Am J Surg Pathol* 2004, 28:479-488.
- [87] Zhan WH, Wang PZ, Shao YF, Wu XT, Gu J, Li R, et al. Efficacy and safety of adjuvant post-surgical therapy with imatinib in gastrointestinal stromal tumor patients with high risk of recurrence: interim analysis from a multicenter prospective clinical trial. *Chin J Gastrointest Surg (Chin)* 2006; 9: 383-387.

- [88] Yamamoto H, Oda Y, Kawaguchi K, Nakamura N, Takahira T, Tamiya S, Saito T, Oshiro Y, Ohta M, Yao T, Tsuneyoshi M: c-kit and PDGFRA mutations in extragastrointestinal stromal tumor (gastrointestinal stromal tumor of the soft tissue). *Am J Surg Pathol* 2004, 28:479-488.
- [89] Y. Shinomura, K. Kinoshita, S. Tsutsui, and S. Hirota, "Pathophysiology, diagnosis, and treatment of gastrointestinal stromal tumors," *Journal of Gastroenterology*, vol. 40, no. 8, pp. 775-780, 2005.

Gastrointestinal Stromal Tumor

Edited by Prof. Raimundas Lunevicius

ISBN 978-953-51-0580-0

Hard cover, 120 pages

Publisher InTech

Published online 27, April, 2012

Published in print edition April, 2012

Almost 30 years have gone by since the postulation that GISTs derive from mesenchymal stem elements, and only 15 years have gone by since the definitive detection of origin of GISTs. Research in the last decade was more focused upon the justification of imatinib mezylate therapy in GISTs and clarification why a secondary resistance that occurred during the kinase inhibitors therapy. The era of therapy for GISTs, targeting the primary activating mutations in the KIT proto-oncogene; is being proclaimed as bringing the message of special importance to the pathologist role in multidisciplinary team that are responsible for treating patients with locally advanced or metastatic GIST. This is the first conclusive message forthcoming from this book. On the other hand, the book provides summarised and case-based knowledge on current management of gastrointestinal and extragastrointestinal stromal tumours. We hope that this book may be considered as a worthwhile timely addition to clinical science dissemination, medical education, further basic and clinical research.

How to reference

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Selim Sözen, Ömer Topuz and Yasemin Benderli Cihan (2012). The Role of the Surgeon in Multidisciplinary Approach to Gastrointestinal Stromal Tumors, *Gastrointestinal Stromal Tumor*, Prof. Raimundas Lunevicius (Ed.), ISBN: 978-953-51-0580-0, InTech, Available from: <http://www.intechopen.com/books/gastrointestinal-stromal-tumor/surgical-treatment-the-role-of-the-surgeon-in-multidisciplinary-approach-to-gastrointestinal-stromal>

INTeCH
open science | open minds

InTech Europe

University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
www.intechopen.com

InTech China

Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821

© 2012 The Author(s). Licensee IntechOpen. This is an open access article distributed under the terms of the [Creative Commons Attribution 3.0 License](https://creativecommons.org/licenses/by/3.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

IntechOpen

IntechOpen