The aim of this study was to present current knowledge about a nospecific inflammation of mucosa within segments of colon excluded from normal bowel passage called as a "diversion colitis" (DC) and to try to determine the role of factors which might modify the clinical course of DC. We also answered the question; how to treat DC: conservatively or surgically?

Our own experience with DC concerns 145 patients (which is most numerous and well exactly examined series presented in literature).

In the group of patients studied, clinical signs of DC were present in over 70% of patients (early signs were low abdominal pain and tenesmus, while anal oozing appeared later).

Predominating endoscopic features of DC in the group of patients studied were:

a. blurring of vascular pattern (in app. 90% of patients);
b. contact bleeding (in app. 80% of patients);
c. mucosal oedema (in app. 60% of patients).

Results of own observations and literature data indicate, that morphologic alterations in the segment of bowel excluded from normal passage are probably vasogenic consisting in atrophy and inflammation of the allergic type (this would confirm the theory about vascular etiology of DC). In our material, we have not noticed any trend toward hyperproliferation or dysplasia in the excluded segment of colon, supporting the thesis that these disturbances are largely reversible. Clinical pathology of DC does not depend on age, sex, cause and type of surgical procedure performed, mode of surgery or concomitant diseases.

Authors suggested an alternative algorithm of diagnostic work-up in patients suspected of DC, and proposed that patients with a segment of bowel excluded from normal passage be subdivided into three groups:

1. Patients with no clinical, endoscopic nor morphologic signs of DC.
2. Patients with moderate signs of DC.
3. Patients with severe signs of DC.

Patients in the group 1 should remain under continuous specialised supervision, because they are at risk of developing DC, while patients in the groups 2 and 3 should undergo surgical restoration of bowel continuity. This applies particularly to group 3, where indications for surgery do not stem from risk of hyperproliferation, dysplasia or malignant transformation, but from that of a massive inflammation, which may constitute a danger for patientís health and even life.

Authors also underline that DC can be treated conservatively but the best and most successful and remained method of treatment of DC is the operation of decolostomy, which means restoration continuity of digestive tract.

Key words: Diversion colitis, colostomy, Hartmann’s operation, colostomy closure, reversal of Hartmann’s pouch.

A wide spectrum of etiologies and pathogenic mechanisms are connecting with colitis. There are many types and clinical manifestations of non-IBD forms of colitis like : Behcet’s syndrome, diverticular colitis, ischaemic colitis, radiation colitis or microscopic colitis. But nonspecific inflammation of mucosa within segments of colon excluded from normal bowel passage described by Basil Morson in 1972. This condition was defined then as "defunctioned bowel". A few years later, in 1979 Donald Glotzer coined the term Diversion colitis (DC). His paper dealing with this issue was published in Gastroenterology in 1981. Since then, terms diversion colitis have found a permanent place in world literature but at least little symptoms describing these syndrome to the publication were revealed in world literature. DC didn’t appear in the Polish writing except my studies.

There are several hypotheses explaining the mechanism of inflammation developing in the stump of colon excluded from normal bowel passage. The pathogenesis of...
DC up to now is still not very clear and not well documented. One of theories proposed by authors in literature is a ischaemia, however further studies are needed to firmly establish this view. According to one of them, DC might be caused by a deficit of short-chain fatty acids. In normal conditions, non-absorbable carbohydrates present in colon lumen in the form of fiber are transformed by bacterial fermentation into short-chain fatty acids. Type of ingested food determines the kind and intensity of fermentation: insoluble fibers do not undergo bacterial fermentation and contribute to the formation of stool mass. Fibers soluble in water, like pectins, are nearly completely metabolised by bowel flora. Insoluble starch constitutes 10-20% of all starch consumed in Western countries. The content of insoluble starch ranges from 75% in green bananas to 2-10% in white bread and less than 1% in boiled rice. Sugars like lactose and sucrose may not be absorbed in small bowel and reach large bowel. This is why diet rich in fibers, insoluble starch and complex carbohydrates (the so called residue-rich diet), leads to higher level of short-chain fatty acids. These fatty acids adsorbed by cells lining colon mucosa are an important source of energy, regulate intracellular pH, cell volume and other functions associated with ion transport, cell proliferation, differentiation and gene expression. Therefore, short chain fatty acids play an essential role in the maintenance of integrity of colon mucosa and its metabolism. Lack of proper bacterial flora leads to a deficiency of short-chain fatty acids. Most studies on bacterial flora of distal segment of colon have been conducted on relatively small groups of patients. It was thought that DC was caused mainly by a specific pathogen. Unfortunately, cultures of smears obtained from lumen of colon excluded from normal bowel passage did not yield such a pathogen. It was also suspected that disturbed equilibrium of saprophytic flora may lead to disturbances in the environment of colonocytes. This theory was confirmed by studies on short-chain fatty acids synthesised by normal colon flora. A decreased number of anaerobic bacteria in the distal segment of colon excluded from bowel passage may be a factor limiting the production of short-chain fatty acids. This theory seems attractive but, until now, appears incomplete. It’s main shortcomings are abnormal bacterial flora found in such excluded bowel segments and widely diverging composition of bacterial flora in patients studied. The hypothesis of Harig that short-chain fatty acids may be destroyed by colonocytes, is confirmed by the fact that administration of such fatty acids per rectum induces resolution of DC symptoms. The study by Harig, who authored the hypothesis that DC is caused by a deficit of short-chain fatty acids, included 4 patients in whom all possible causes of inflammation other than DC have been ruled out. Short-chain fatty acids administered in the form of enema twice daily for 6 weeks induced a significant improvement of endoscopic appearance of colon mucosa as compared with control group, where normal saline enemas were used. Interruption of treatment for 2 weeks caused a recurrence of clinical symptoms and deterioration of endoscopic findings. Unfortunately, the study by Guillemot did not confirm this hypothesis. This study included 13 patients with signs and symptoms of DC (this was a prospective, randomised, double-blind study). Treatment of DC with butyrate enemas and administration of placebo were compared. In both groups no improvement was noted in endoscopic or in histopathologic assessment. Real cause of such divergent results remains unknown and requires further studies. Observations did not reveal any statistically significant difference in the incidence of DC in correlation with the type of stoma (single-lumen, double-lumen stoma) or kind of the end-stoma (end-stoma after Hartmann’s procedure and the so-called mucous fistula). There were no differences in the incidence and severity of DC in correlation with patients’ age and original cause of surgery.

There is still a lot of uncertainty as related to the true incidence of clinical symptoms of DC, and published data are frequently contradictory. An analysis of pertinent literature revealed, that inclusion of patients with ulcerative colitis or Crohn disease in the discussion about DC is inappropriate and may lead to incorrect conclusions.

Based on the review of literature we may see that at present the body of data related to DC is relatively scanty and any conclusions concerning this issue are often incoherent and contradictory. It should be emphasised that research on DC that Authors have been conducting since many years has significantly contributed to bridge this gap and has answered many questions. Is there a coherent clinical syndrome consistent with DC? Is this syndrome caused by inflammation or is it simply due to dysfunction of the distal segment of colon? Are there any endoscopic and histopathologic features characteristic for DC?

Basic clinical features of DC are: tenesmus, crampy abdominal pain and serous, bloody or mucous anal discharge. In the group of 145 patients included in this study, over 70% of them reported at least one of these symptoms. Most patients reported tenesmus often associated with other symptoms.

Serous, bloody or mucous anal discharge were present in app. 40% of patients, but in only 5,5% of them this constituted the sole clinical symptom. Pain was the least frequently reported symptom (14,7% of patients). Our results differ somewhat from those reported in the literature, where in most authors’ opinion the issue of DC is rather marginal, the condition is usually asymptomatic and has no clinical significance. In some papers authors rise the issue of bloody anal discharge, which was so severe as to require blood transfusion. In our experience, we had not a single such case, although bloody anal oozing was reported fairly often (in app. 40% of patients). It should be emphasised that the discharge was usually scanty and mucous. This difference is probably caused by different criteria of selection of patients.

We used the Harig’s scale for endoscopic assessment of DC features, which, in our opinion, most objectively and accurately defines the endoscopic appearance of inflammation of bowel mucosa and is generally accepted and used. When assessing bowel mucosa, the following...
items were taken into account: vascular pattern, oedema, contact bleeding, the so called granulation of mucosa, the presence of erosions and ulcerations. Within the segment of colon excluded from normal passage, in over 90% of patients. Contact bleeding was present in appr. 80% of patients in the study group, while oedema - in nearly 60%. Granulation of mucosa was present in about 20% of cases while erosions and ulcerations - in about 10%. There are few published reports related to DC with data concerning results of endoscopic studies. Most of them quote only total percentages of inflammatory lesions within colon segment excluded from passage. So, according to Winslet et al., this amounts to 55%, and according to Ferguson et al. (22) this is 70%, patients studied present endoscopic features of DC.

Our studies have demonstrated that basic histopathologic features of DC are inflammation and atrophy of bowel mucosa with a significant decrease of proliferative activity, increased numbers of eosinophilic granulocytes and plasmacytes in the inflammatory infiltrate. The inflammatory process is an active one, as testified by the presence of neutrophils and an increased number of cells migrating across colon epithelium. A frequent morphologic feature are conglomerates of lymphocytes within colon mucosa with formation of lymph nodules and centers of proliferation. Inflammation is usually associated with a relative decrease of secretion of mucus by epithelial cells and a relative increase and enlargement of blood vessels.

The most important observation is that the above mentioned morphologic features in the same patient differ significantly in the postresection stump and in the stomal stump, independent of the underlying disease for which the surgery has been performed. This authorizes us to conclude, that DC is a separate nosologic entity and it’s diagnosis is based on classic histopathologic examination, if only specific morphologic criteria are met.

According to most authors’ opinion (in fact, there are few papers dealing with this subject), inflammation of colon is associated with altered mucosal cell transformation. These alterations lead to an increased proliferative activity of epithelial cells (as assessed by both mitotic activity and expression of the so-called proliferation antigens - PCNA and MIB1). On the other hand, in some pathologic conditions of colorectal mucosa, e.g. chronic ischemia, a common feature is a decreased proliferative activity of colon epithelium, although this is still a matter of debate.

In our studies, proliferative activity of colorectal epithelium was assessed both in normal bowel and in bowel excluded from normal passage. I assessed also proliferative activity of colonocytes in patients of the control group. Studies were performed using monoclonal anti-bodies PCNA, MIB1 and c-erbB2. Analyses demonstrated that proliferative activity measured both by expression of PCNA and MIB1 decreased significantly in the segment of bowel excluded from normal passage as compared with normal bowel and with control group. In all cases studied, a very weak reaction to the c-erbB2 oncoprotein was noticed in less than 1% of glandular cells of colon mucosa.

Our studies demonstrate that greater severity of morphologic and endoscopic indices of inflammation in colon is not accompanied by increased proliferative activity. Hyperproliferation is a very frequent finding in ulcerative colitis. From the theoretical point of view, it would be interesting to know if there is any correlation between clinical signs, endoscopic and morphologic alterations in individual patients with DC.

Our studies have shown a statistically significant correlation between clinical symptomatology and endoscopic findings. This means that patients with more severe clinical signs of DC had also more severe endoscopic lesions (higher score as assessed by Harig’s scale). However, both these modes of evaluation did not show any statistically significant correlation with morphologic findings. These results show a certain discrepancy in morphologic alterations, endoscopic lesions and clinical signs. A possible explanation for this phenomenon may be, that morphologic evaluation took into account very many factors, which could falsify final results. Endoscopic and clinical scales are fairly simple and transparent, so that comparisons make any correlations easier to detect.

To sum up our results and an analysis of data published by others, we may conclude that the group of patients with DC presented in this paper is the largest, most uniformly and thoroughly examined of all hitherto published concerning this subject.

Therefore, we would like to present our opinion and answer the question; how we diagnose and treat DC?

DC may be diagnosed only by combination of three sets of findings: clinical, endoscopic and histopathologic (morphologic). Assessment of clinical signs is quite subjective, as mentioned before. This depends largely on good contact and close patient - doctor relationship, when the key factor is doctor’s experience in working with this very specific group of patients. Is seems, therefore, that doctor’s experience may be essential in early diagnosis of DC based solely on nonspecific clinical signs.

Based on this study we may conclude, that endoscopic findings may be helpful in reaching final diagnosis. As approximately 70% of patients in the study group scored 3 and more on the Harig’s scale, in our opinion the score 3 should be considered a borderline value. This means that if a patient scores 3 on endoscopic examination, than he/she should be suspected of having DC and become a candidate for morphologic assessment. If the score is less than 3 and clinical symptoms are mild to moderate, such a patient should be monitored and a control visit scheduled within 3 months. If clinical signs are severe then DC should be diagnosed, even if endoscopic lesions are mild and result in low Harig’s score. Morphologic examination finally settles the issue, or rather it allows a definitive confirmation of DC. It must be emphasised, that an unambiguous diagnosis may be formulated only if histopathologic examination discloses concomitant signs of inflammation, atrophy and/or ischemia.

The suggested pattern of diagnostic work-up confirms that only close cooperation between surgeon and pathologist may contribute to enrich our knowledge about DC.
and to formulate an unquestionable diagnosis of diversion colitis.

Based on the above presented data, we feel authorised to suggest, that patients with segments of their colon excluded from normal passage be subdivided into 3 groups:

1. Group of patients with no clinical, endoscopic nor morphologic signs of DC.
2. Group of patients with mild or moderate signs of DC.
3. Group of patients with severe DC.

Patients of the group 1 should remain under close specialized supervision because they are at risk of developing DC, while patients of the groups 2 and 3 should undergo surgery aiming at restoration of continuity of digestive tract. This applies mainly to the group 3, where indications for surgery do not stem from the risk of hyperproliferation, dysplasia or neo-plastic transformation, but from that of massive inflammatory process, which may be hazardous for health and even life. Certainly, the decision to restore continuity of digestive tract is dependent on patient’s own decision, but it is the role of doctor to exert a positive influence on patient, to help him/her to reach an optimal decision. It should be emphasised that patients of the group 1 are also candidates for surgery if there are no contraindications, as they too are at continuous risk of developing DC. We must remember, that every stoma patient with no absolute contraindications for restoration of continuity of digestive tract, should be operated on in order to improve his/her quality of life if only this is technically feasible. In practice, however, there may be circumstances which preclude restoration of continuity of digestive tract (lack of consent, subjective positive attitude towards life with stoma, technical problems during surgery). In this case, DC must be treated conservatively. Until now, the only effective method of conservative treatment of DC (as mentioned above) are enemas with solutions of short-chain fatty acids (SCFA), which provide only temporary relief. Somehow de Oliveira-Neto evidences that short-chain fatty acids (SCFA), which are functionalized colon. Apart from SCFA Eggenberger and Farid proposed steroid enemas or 5-aminosalicylic acid enemas. But we can not agree with the opinion presented by authors that if DC is permanent, medical treatment is unsuccessful, and symptoms persist, acceptable surgical candidates should undergo resection of the excluded bowel. In our opinion most of these cases can be treated by reversal of the colon – by anastomosis (reestablishment of digestive tract). In our experience DC which existed in patients after Hartmann’s operation, were resigned in 100% after reversal operation in time of some weeks.

A very strong case for a careful follow-up of patients with DC is the risk of local recurrence or development of a metastasis in post-resection stump in patients operated on for colorectal cancer. In our experience, we saw three such cases.

DC is a little known disease, even among surgeons who treat colorectal diseases in their everyday practice. Education of both doctors and nurses in this field is urgently needed. In our opinion, proctologic and stoma out-patient clinics are best suited for this purpose.

CONCLUSIONS

1. In the group of patients analysed, clinical signs of Diversion Colitis (DC) were present in over 70% of cases.
2. Predominating endoscopic features of DC in this group of patients were:
   a. blurring of vascular pattern (in app. 90% of patients);
   b. contact bleeding (in app. 80% of patients);
   c. mucosal oedema (in app. 60% of patients).
3. Results of our studies indicate, that morphologic alterations in the segment of colon excluded from normal passage showing atrophy and inflammation with allergic component.
4. In our material, we have not seen any trend towards hyperproliferation and dysplasia in the segment of colon excluded from normal passage, thus suggesting that these alterations are largely reversible.
5. Clinical pathology of diversion colitis does not depend on age, sex, underlying disease and cause of surgery, timing of surgery or concomitant diseases.
6. Diversion colitis can be treated conservatively by enemas with solutions of short-chain fatty acids (SCFA), steroid enemas or 5-aminosalicylic acid enemas or irrigation with fibres which all above provide only temporary relief.
7. In our opinion most effective method of treatment Diversion Colitis with permanent good results is the operation of reversal of the colon – by anastomosis (reestablishment of digestive tract). In our experience DC which existed in patients after Hartmann’s operation, were resigned in 100% after reversal operation in time of some weeks.

SUMMARY

KAKO TRETIRATI DIVERZIONI KOLITIS? AKTUELNO MEDICINSKO ZNANJE, NAŠE ISTRAŽIVANJE I ISKUSTVO

Cilj ove studije bio je da pokaže trenutno znanje o nespecifičnom inflamatornom oboljenju mukoze u segmentu kolona isključenom iz normalnog kontinuiteta, nazvanom "diversion colitis" (DC) i pokušaj da se odredi uloga faktora koji mogu modificovati klinički kurs DC. Takodje smo odgovorili i na pitanje: kako tretirati DC: konzervativno ili hirurški?

Naše iskustvo zasnovano je na 145 pacijenata (što je najbrojnija i najkonkretnije obradljiva serija u dosadašnjoj literaturi).

U obrađenoj grupi, klinički znaci DC javili su se kod preko 70% pacijenata (rani znaci bili su bolovi u donjem partijama trbuha i tenezmi, dok se analna sekrecija kasnije pojavljivala).

U predominantne endoskopske karakteristike kod naših pacijenata spadaju
a. nejasna vaskularna šara (kod oko 90% pacijenata)
b. kontaktno krvenje (oko 80% pacijenata)
c. edem mukoze (oko 60% pacijenata).
Rezultati naše opservacije i literaturni podaci pokazuju da su morfološke promene segmenta creva isključenog iz normalnog kontinuiteta digestivnog trakta najverovatnije vazogenog porekla koje rezultuje atrofijom i inflamacijom alergiskog tipa (ovim se potvrđuje teorija vaskularne etiologije DC). U našem materijalu nismo primetili nikakvu tendenciju ka hiperproliferaciji ili displaziji u ekskludirnom segmentu kolona, podražavajući tezu da su ove promene reverzibilne prirode. Klinička patologija DC ne zavisi od godina, pola, uzroka bolesti i tipa hirurške procedure.

Ključne reči: diverzioni kolitis, kolostomija, Hartmanova operacija, zatvaranje kolostote.

BIBLIOGRAPHY