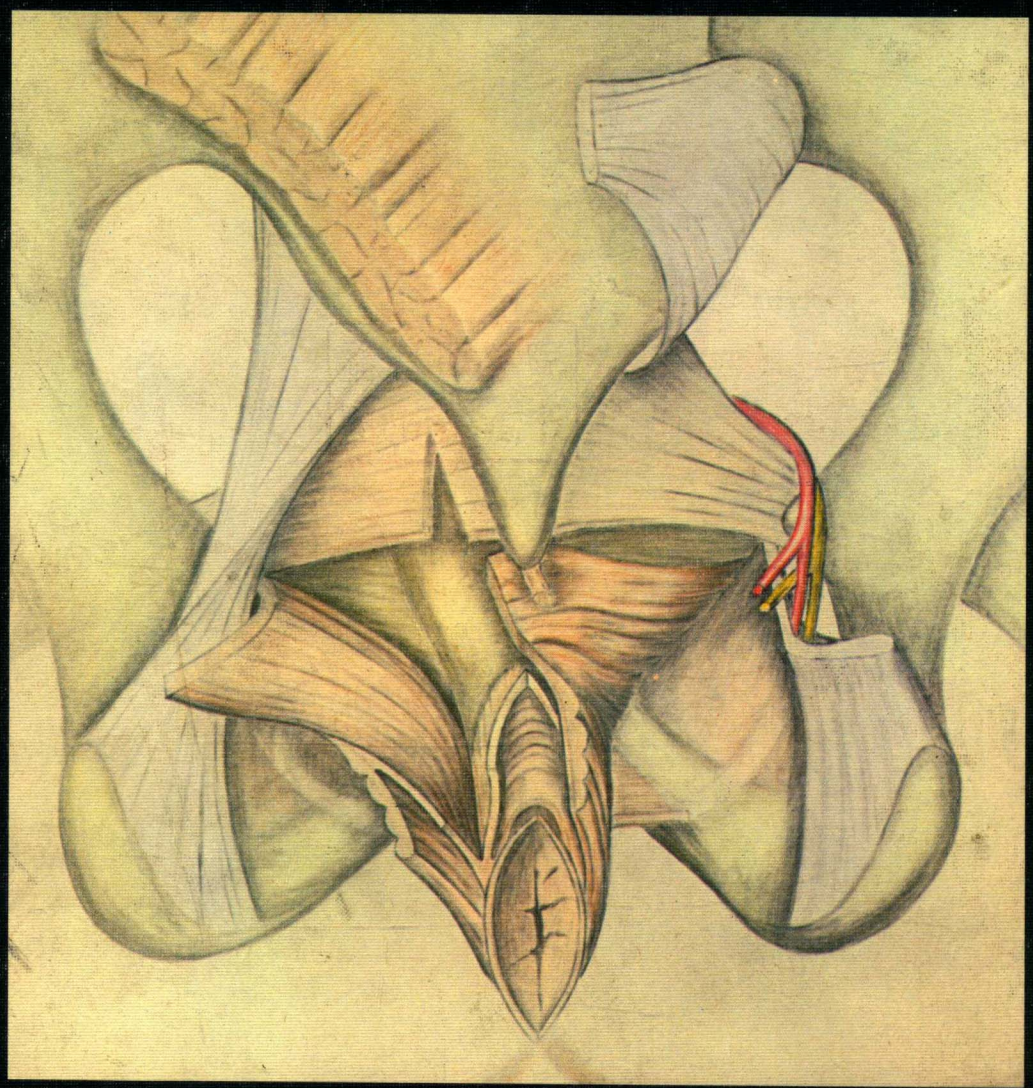
A. Huber A. H. C. v. Hochstetter M. Allgöwer

Transsphincteric Surgery of the Rectum

Topographical Anatomy and Operation Technique



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Transsphincteric Surgery of the Rectum

Topographical Anatomy and Operation Technique

With 31 Figures, Most in Color, in 58 Separate Illustrations

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Foreword

More than a century ago, Cripps successfully employed the direct and complete division of the anal sphincters as a means of approaching the lower rectum and anal canal, and reported on a series of 36 patients who had been treated in that fashion. Cripps was pleasantly surprised to find good fecal continence in over two-thirds of the patients during later follow-ups, despite the fact that the divided sphincters had not been repaired. The transsphincteric procedure was largely forgotten in subsequent years, however, and only the parasacral proctotomy of Kraske, which spared the anal sphincters, can be said to have gained an established place in the "surgical armamentarium."

It remained for York Mason to redirect the attention of the surgical community to the great potential of the transsphincteric approach and the excellent continence that can be achieved through adequate repair of the divided sphincters. Having recognized the outstanding practical value of this procedure, we felt it necessary to define more precisely the anatomical prerequisites that would ensure minimum operative bleeding, and to bring the procedure more in line with current knowledge of normal continence and defecation.

Dr. A. Huber, in consultation with the director of the Institute for Clinical Anatomy of our surgical department, Prof. A. von Hochstetter, did many months of dissection work on fresh anatomic preparations in an effort to explore and refine the various aspects of the transsphincteric approach. During this time his discoveries were repeatedly tested for clinical relevance in patients suffering from rectal disease. The present, short monograph details the experience and insights that have been gained from this process.

The major indications for the transsphincteric, "open-book" procedure are benign but refractory rectal diseases such as rectovaginal fistulae, benign ulcers, villous adenomas, marked rectal prolapses, and selected cases of marked rectocele. In the latter condition in particular, it is advantageous to combine an extensive sleeve resection of the rectum with reefing of the puborectalis sling to modify

the anorectal angle. If adequate ventilation is maintained in the prone patient, the 2- to 3-hour operation is remarkably well tolerated even by aged individuals.

In the case of rectal malignancies, the procedure should be limited to growths which have not spread beyond the rectal wall (UICC $T_1N_2N_0$ or Dukes Type A). But the "sacred cow" of a 5-cm distal wall clearance may at last be dispensed with. The fate of a rectal carcinoma hinges on its pararectal spread, and a safety margin of 2 cm is generally sufficient for wall resections. Thus, *small* growths less than 3 cm in diameter that are confined to the bowel wall may be removed by a sphincter-conserving resection up to 5 cm from the anocutaneous junction, relying upon frozen tissue sections to monitor the adequacy of the resection.

We personally are very pleased with this addition to our surgical arsenal and hope that it will be equally useful and successful in other hands.

Basel, September 1983 Martin Allgöwer

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Part I
Transsphincteric Surgery of the Rectum

1. Significance

Surgical removal of diseased tissue from the lower rectum, or the resection of this bowel segment, calls for a highly refined operating technique. This is due mainly to the close proximity and attachments that the lower rectum has with the pelvic floor muscles and the anal sphincters. Together, the rectum, pelvic floor and sphincters comprise an organ system whose function is to ensure normal defecation and anal continence. The challenge to the surgeon is to cure disease in this hard-to-reach area without destroying fecal continence. Transsphincteric exposure of the rectum is a technique which is compatible with this goal. Applied selectively, this procedure offers an excellent chance of a cure without forcing the patient to accept a "preternatural anus."

The idea of a transsphincteric approach to the rectum is not new. Various authors had already outlined its basic features by the latter part of the 19th Century. In 1875 Verneuil and Kocher described a posterior exposure of the rectum which required a coccygectomy, and in 1885 Kraske recommended that partial resection of the left ala of the sacrum be added to this procedure. In 1876 Cripps published an essay on the transsphincteric approach to the rectum and reported on 36 patients whose rectal tumors had been removed by that technique. It is interesting to note that, although Cripps made no attempt to suture the divided sphincters, 23 of the 36 patients regained full fecal continence following surgery. Although numerous references were made to this procedure in subsequent years (Bevan 1917; David 1943; Larkin 1959; Oh and Kark 1972), a great many surgeons were reluctant to adopt it, apparently in the belief that division of the levator ani and sphincters would result in permanent anal incontinence. More recently, Mason (1974) published an account of his left parasacral transsphincteric exposure and the excellent results he achieved with it. Since that report, we have been practicing the Mason technique of transsphincteric rectal surgery at the Kantonsspital Basel, Switzerland, and have obtained equally good results.

We feel that the transsphincteric approach will assume an increasingly important place in the anorectal surgery of the future. Given the strict criteria for patient selection, however, it is unlikely that this operation will become routine, at least in the general surgical hospital. Moreover, the pelvis and pelvic floor possess a highly complex and variable anatomy. For example, we have observed large individual differences in the mass and arrangement of the levator ani muscle, as well as in the "perirectal space," which frequently contains a large amount of fat permeated with delicate blood vessels that are highly prone to injury. In the literature on transsphincteric rectal surgery, anatomical aspects usually are discussed only in highly simplified terms, and questions relating to anatomical details such as the innervation of the pelvic floor frequently go unanswered. In an effort to fill this gap, we have created a combined surgical and anatomical atlas in which a special section has been devoted to the topographic anatomy of the anorectal region.

2. Definition

Transsphincteric surgery of the rectum refers to procedures in which exposure of the terminal bowel segment is gained through a posterior division of the pelvic floor, possibly combined with an anal sphincterotomy. During the operation the patient is prone with the legs slightly abducted and the hip and knee joints flexed 90° (the Heidelberg position). Through a left parasacral incision, the pelvic floor is opened, and, if necessary, the sphincters are divided so that the distal portion of the rectum and anal canal can be visualized. At the conclusion of the procedure the pelvic floor and sphincters are anatomically repaired so that normal defecation and continence are preserved.

3. Indications

Disease

The following diseases of the rectum and anal canal are considered to be indications for transsphincteric surgery:

- Early, low-sited rectal malignancies which are not amenable to a low anterior resection.
- Benign and premalignant tumors which cannot be radically removed by the transanal route.
- Rectal prolapse with incontinence.
- Rectal fistulae and strictures which cannot be managed by any other method.
- Lesions of the pelvic floor and sphincters.
- Malformations.

Indications are discussed in greater detail in Part IV.

Localization

The site of the lesion is another important criterion for patient selection. The transsphincteric approach is best suited for lesions located between 4 and 12 cm from the anal verge. Complete division of the sphincters extends the operative field caudally to the pectinate line. Under favorable circumstances, cranial portions of the rectosigmoid located up to 30 cm from the anal verge can be reached by the transsphincteric route. If this approach does not allow adequate cranial mobilization (which is unlikely with careful preoperative planning), then a laparotomy will also be required. Turning the patient to the supine position and back to the Heidelberg position is somewhat cumbersome but should not cause serious difficulties if proper precautions are taken.

Patients

The Heidelberg position is surprisingly well tolerated even by aged and debilitated patients. Assuming that anesthesia is correctly administered, there need be no hesitation in selecting these patients for transsphincteric surgery. The operation lasts about $2^1/_2$ hours on the average and apparently is less stressful than a laparotomy, for example.

4. Preoperative Preparation

As in any surgical procedure, patient selection, preoperative preparation and postoperative care have a critical bearing on the success of the operation.

Preoperative preparations include the thorough cleansing of the colorectum, preferably by an intestinal lavage of the type generally recommended for colonic surgery. If the passage of fecal matter is significantly impaired by rectal disease, then a three-stage procedure employing a temporary colostomy is advised. We administer prophylactic antibiotics shortly before and during the operation. This is an effective means of preventing infection, provided sufficiently high serum levels are present at the time of operation.

An operating table must be made available which allows the patient to be placed in the Heidelberg position. The table setup, the Heidelberg position, and preparation of the operative field are described in Part III.

5. Postoperative Care

The transsphincteric operation is excellently tolerated, and early ambulation is encouraged. Oral nutrition may be started as soon as bowel motility has resumed – usually on about the second postoperative day. Enemas are to be avoided, but mineral oil preparations may be given orally to aid bowel movements.

6. Follow-up Examinations

Regular follow-up examinations should be scheduled for the purpose of monitoring surgical wound healing and testing for continence. Examinations for healing are especially important following the removal of malignant growths and may be conducted as a part of general oncologic aftercare. While the bowel lumen is accessible to inspection through a proctoscope, computerized tomography is the best technique for evaluating the pararectal space, allowing the very early detection of recurrent growths and local metastases.

Postoperative continence is assessed on the basis of subjective reports and objective findings (manometry). It may require weeks or even months to develop, especially following the transsphincteric resection of a rectal prolapse with reefing of the puborectalis sling and a "posterior release" (Fig. 1, pp. 8/9). Particular attention should be given to subjective reports on continence for flatus and for liquid and formed stool at rest as well as during coughing, sneezing, and other acts which raise the intra-abdominal pressure. The tone and voluntary function of the external sphincter and levator ani can be assessed by rectal palpation.

7. Complications

Complications are rare. Patients who were continent preoperatively will regain continence within a few weeks after surgery. If incontinence is present preoperatively, it often is markedly improved by reefing and posterior release of the levator slings and, with rectal prolapse, by resection of the prolapsed bowel. If there is already severe preexisting damage to the pelvic floor, there is no guarantee that surgery will be of value in improving continence. The attempt should nevertheless be made, however, because surgery can only help the situation and cannot harm it.

Postoperative wound infection is rare if the bowel has been thoroughly cleansed prior to surgery, a suitable operating technique was employed, and prophylactic antibiotics have been administered. Infection can cause dehiscence of the sutures in the pelvic floor muscles and sphincters, leading to incontinence. Treatment for an extensive wound infection includes broad exposure and drainage of the wound, and the establishment of a temporary colostomy. After the infection has resolved, it should be possible to repair the pelvic floor secondarily and restore anal continence.

If infection arises from a gap in the suture line used for a rectal anastomosis and remains confined to a fistulous tract, there is little risk that continence will be damaged. The drained infection will heal if the rectum is kept empty for a time, either by making a temporary colostomy or by feeding an "astronaut" diet.

8. Remarks on Continence

Continence refers to the voluntary and involuntary control of defecation. A distinction may be made between gross and fine continence, where gross continence is the ability to control the voiding of large, solid feces, and fine continence is the control of small fecal masses, liquid feces and flatus. Thus, varying degrees of fecal incontinence may be present. Incontinence is said to be complete when the patient has no control whatsoever over the expulsion of feces or flatus.

Continence is maintained by a complex organ system comprised of the following elements:

- The rectum, the pelvic floor muscles (most notably the puborectalis sling), and the internal and external sphincters.
- The sensory and motor functions of these organs.
- Reflexes and central nervous mechanisms.

The following factors in this system contribute to continence:

The curvatures of the rectum in the frontal and sagittal planes and its transverse folds (Houston, Kohlrausch) retard progression of the fecal mass. Of particular importance is the anorectal angulation, whose function can be likened to that of a flutter valve or the phenomenon of a kinked garden hose. The anorectal angle is maintained by the pull of the puborectalis sling and by the anococcygeal ligament.

The stellate cross-section of the anal canal mucosa and its corpus cavernosum-like elements (hemorrhoidal plexus) are believed to exercise a sealing function.

The pressure that can be measured within the anal canal at rest results from the resting tone of the internal and external sphincters and the puborectalis muscle. It normally ranges between 30 cm H_2O (2.94 kPa) and 50 cm H_2O (4.9 kPa). With this pressure, the anal canal creates an effective barrier against the pressure of 10–30 cm H_2O (0.98–2.94 kPa) that resides within the rectum. Distension of the rectum reflexly triggers a transitory relaxation of the internal sphincter, accompanied by a measurable pressure fall within the anal canal. This makes possible the "sampling response" which enables rectal contents to be discriminated and their elimination controlled.

Voluntary contraction of the external sphincters can strengthen the barrier effect by increasing the pressure in the anal canal. This voluntary "squeeze pressure" can be sustained for only about a minute, however.

A rise of intra-abdominal pressure stimulates an increase in the tone of the external sphincters and puborectalis. This mechanism helps to maintain continence during coughing, sneezing and laughing.

A gradual increase in rectal distension produces a corresponding rise of pressure within the anal canal up to a level of 80–130 cm H_2O (7.84–12.74 kPa) (the "resting yield pressure"). Further distension of the rectum stimulates a voluntary contraction of the sphincters, raising the pressure as high as 400 cm H_2O (39.2 kPa) (the "augmented yield pressure"). One function of this reflex increase in voluntary sphincter contraction may be to preserve continence during sleep. At the same time, the compliant walls of the rectum expand in response to the elevated pressure or increasing mass, thus performing a reservoir function which also contributes to continence. This adaptive response is abolished by low rectal resections, but apparently it can be acquired to some degree by the bowel segment above the anastomosis. It is dependent, moreover, on a functionally-sound sphincter apparatus. Stretching of the external sphincters and the puburectalis sling excites the urge to defecate and triggers a voluntary contraction of these muscles. Two empirical facts are of great interest in this regard:

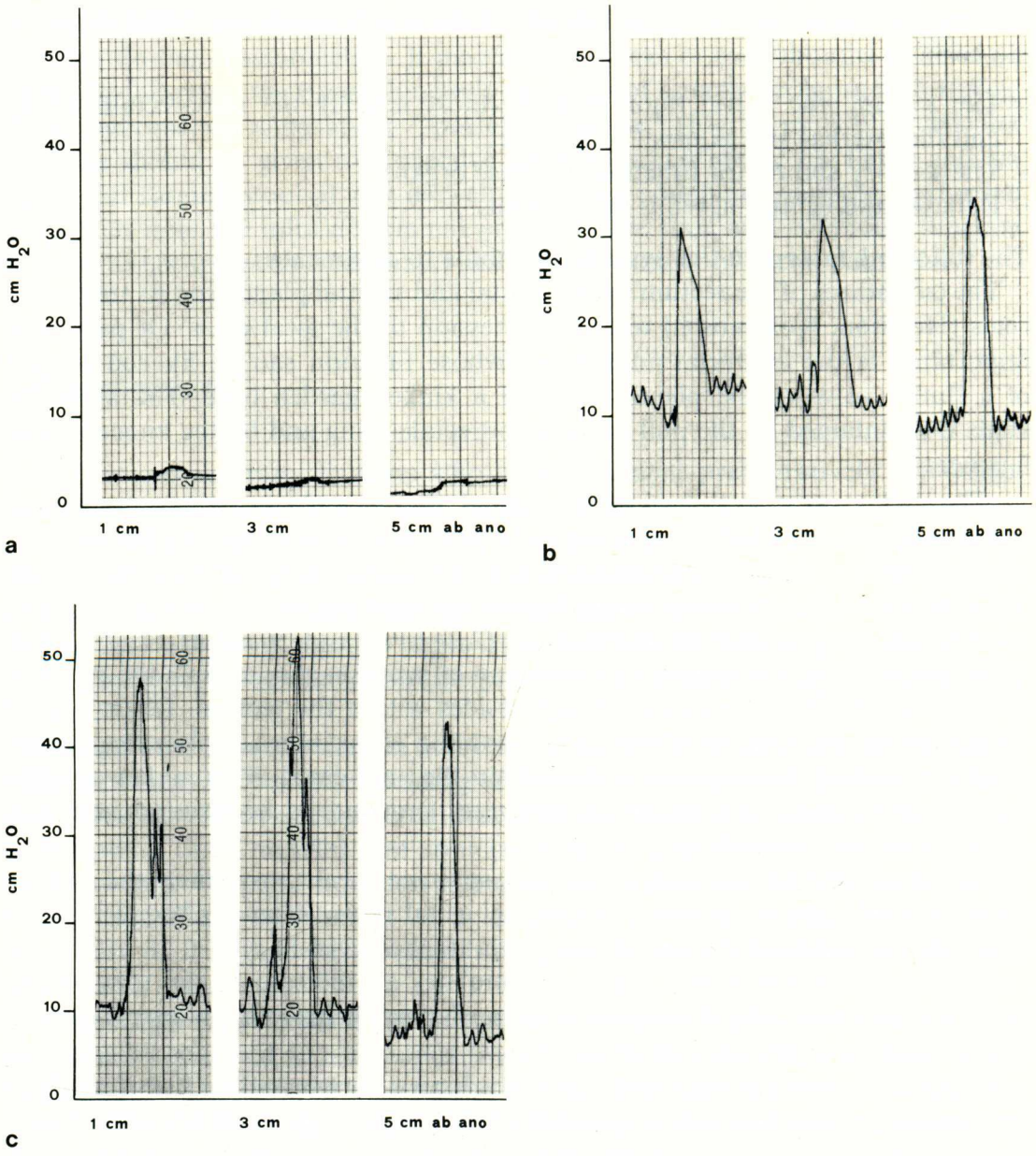
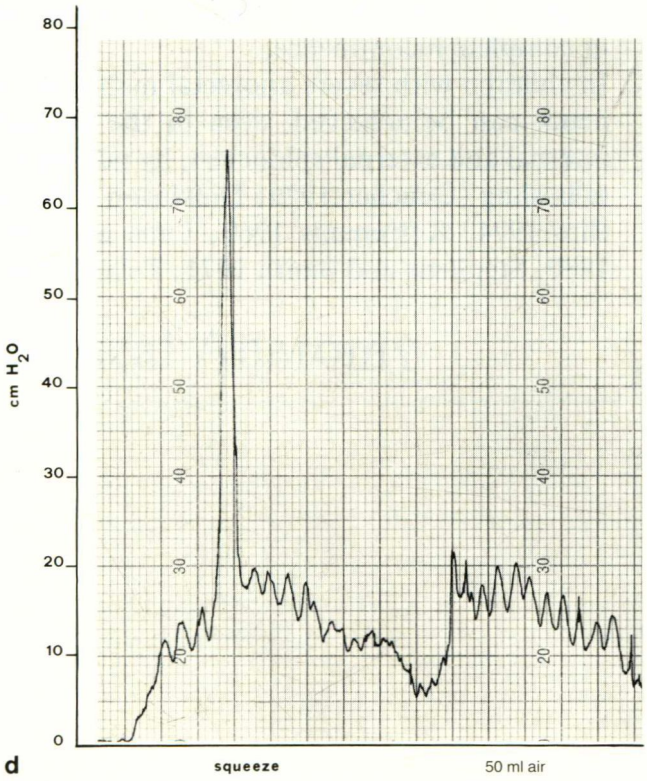


Fig. 1a–d. Manometric curves* of an 82-year-old woman who underwent transsphincteric surgery for rectal prolapse with incontinence. The pressures were measured with open-tipped perfusion-pressure catheters, and closed rectal balloons were used to induce distension. The curves were traced from right to left at a rate of 5 cm/min. The zero baseline and pressure values correspond to the numbers on the ordinate, not those on the record paper.

* M. Durig, M.D., Department of Surgery, Kantonsspital Basel, Switzerland: Personal communication



a Preoperatively the resting pressure in the anal canal was about 3 cm H_2O (0.29 kPa) and showed little increase on voluntary squeezing of the sphincters.

b The rectal prolapse was resected through the transsphincteric approach, the puborectalis sling was reefed, and a posterior release was performed. A 30-cm segment of rectum was resected. Thus, the entire pars pelvina of the rectum was removed, and the "neorectum" consisted of sigmoid colon. One week postoperatively the resting pressure in the anal canal was 12 cm H_2O. Voluntary squeezing of the sphincters produced pressures of around 30 cm H_2O (2.95 kPa).

c At six weeks postoperatively (cf. ***d***) the pressure was approximately 10 cm H_2O at rest (0.98 kPa) and up to 65 cm H_2O (6.37 kPa) on voluntary sphincter contraction.

d Distension of the neorectum reflexly triggered a brief relaxation of the internal sphincter like that seen during physiologic distension of the rectum. Following the pressure fall, a very strong rise of pressure was recorded. This is the "squeeze pressure" produced by voluntary contraction of the sphincters, which halts the propulsive wave in the rectum and can maintain continence for a short time.

1. Loss of the voluntary sphincter muscles, especially the puborectalis, results in complete incontinence.
2. In children with severe anorectal malformations, an acceptable degree of continence can be achieved, even in the absence of the rectum, anal canal, and internal and external sphincters, by pulling bowel through a functional puborectalis sling (Deucher 1976; Dickinson 1978; Goligher 1980; Harris et al. 1966; Ihre 1974; Kerremans 1969; Lane and Parks 1977; Scharli 1981; Shepherd 1980; Stephens and Smith 1971; Telander et al., in press; Wilson 1977).

Part II
Topographical Anatomy