

**MINISTRY OF HEALTHCARE OF UKRAINE
DANYLO HALYTSKY LVIV NATIONAL MEDICAL UNIVERSITY**

«APPROVED»

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Prof. MR Gzegotsky*



**Methodical recommendations for independent work
“SURGERY”**

for preparation of specialists of the second (master`s) level of high education
branch of knowledge 22 “Healthcare”
4th- year students of speciality 222 “Medicine”

“APPROVED”

*meeting of
the Department of Surgery №2
Report № _____
« ____ » _____ 2021*

Head of Department of Surgery №2

_____ *prof. II Kobza*

“APPROVED”

*at the meeting of the Surgical
Methodological Commission
of Danulo Halytsky Lviv
National Medical University
Report № _____*

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*Chief of the Surgical
Methodological Commission
____ prof. VP Andryushchenko*

Methodical recommendations for independent work of students of medical faculty specialty "Medicine", "Pediatrics".

March 1, 2021

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Methodical recommendations were approved at the meeting of the Department of Surgery №2

Minutes № 3 of March 1, 2021

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Preface

In modern conditions, student independence becomes a necessary quality of personality.

Independent work of students is a planned cognitive, organizational and methodological activity, which is carried out without the direct help of the teacher, to achieve results. As a form of organization of individual study of educational material by students outside the classroom, it is the main means of mastering educational material in time free from compulsory subjects.

Independent work is intended for better mastering of the course, expansion and supplementation of lecture material. The teacher provides the student with recommended literature, basic and additional, and, while studying certain topics, specifies it on the list.

The purpose of independent work of students:

- development of creative abilities and activation of students' mental activity;
- formation of students' need for continuous self-replenishment of knowledge;
- development of moral and volitional efforts;
- independent work of students as a result of their moral and volitional efforts.

Independent work as a type of educational activity will be effective under the following conditions:

if this work is clearly organized by the teacher;

if it is a component of the educational process, and not an episodic phenomenon;

if the independent work of students is subject to pedagogical control (assessment and correction of knowledge).

The success of independent work of students is determined primarily by their readiness for such educational activities. In essence, independent work involves maximum activity of students in various aspects: the organization of mental work, the search for harmony, the desire to make meaning beliefs.

The organization of independent work of students in the subject should be carried out in compliance with a number of requirements, including the following:

- substantiation of the need for tasks in general and a specific task in particular, which requires the identification and promotion of positive motives for students;

- openness and general visibility of tasks. All students must know the content of the task, be able to compare the tasks performed in one and in different groups, analyze the correctness and usefulness of the work performed, the relevance of the grades (adequacy of assessment);

- providing detailed methodological recommendations for the performance of work;

- enabling students to perform creative work that corresponds to the conditional-professional level of knowledge acquisition, without limiting them to the performance of standard tasks.

Implementation of an individual approach for independent work. Individual tasks can be performed at the request of all students or some of them (who are creatively gifted, demanding, have extensive practical experience). Individualization of independent work promotes self-realization of the student, revealing in him such facets of the personality which help professional development.

To implement independent work in the process of studying the subject, students perform a set of tasks of different types of appropriate levels of difficulty.

The results of the study of the effectiveness of independent work of students in the educational process allow us to express the following assumptions:

1. The main source of theoretical information for the student is a syllabus of lectures.

2. The duration of the student's work in the library with educational literature decreases, which is often explained by the increase in the workload in the classroom, the increase in the number of tasks and the need to study and work at the same time.

3. The cost of time to perform traditional types of tasks for the processing of theoretical information (analysis, comparisons, answers to questions, explanations, etc.) is reduced. At the same time, the weight of time and productivity of tasks that provide algorithmic-effective and creative levels of knowledge acquisition increases.

To control students' knowledge are used:

- a) oral answers to theoretical questions;
- b) written works.

Completion of independent tasks is a prerequisite for admission to the final test.

The organization and methods of independent work of students must be subject to certain requirements:

- 1) development of motivational attitude in students.
- 2) regularity and continuity.
- 3) consistency in work.
- 4) proper planning of independent work, rational use of time.
- 5) the use of appropriate methods, techniques and techniques.

6) guidance from teachers. The main forms of management of independent work of students are the definition of program requirements for the study of academic disciplines; orientation of students in the list of literature; conducting group and individual consultations; organization of special classes on methods of studying scientific and educational literature, methods of taking notes; preparation of educational and methodical literature, recommendations, monuments, etc.

Independent work of students is provided by a system of teaching aids provided for the study of a particular discipline:

- basic literature (textbook, lecture notes, teaching and methodical manuals);
- additional literature (scientific, professional, monographic, periodical);
- methodical materials (methodical instructions on performance of independent work of students).

Independent work on mastering educational material in a particular discipline can be performed in the library, classrooms, computer classes (laboratories), as well as at home.

The success of independent work of students is determined primarily by their readiness for such educational activities. In essence, independent work involves maximum activity of students in various aspects: the organization of mental work, the search for harmony, the desire to make meaning beliefs.

The teacher is not limited in the choice of other tasks for independent work, provided that the content of the task corresponds to the working curriculum of the discipline.

When drawing up the agenda, anticipating their participation in all major activities carried out in the higher education institution, the student must focus on the curriculum, plans and schedule. Independent tasks can be performed in a workbook, cards, landscape sheets, Word documents.

Instructions for organizing independent work of students.

Independent work is carried out for the purpose of working off and mastering of the educational material defined for independent employment; preparation for future classes and control measures; formation of students' culture of mental work, independence and initiative in the search and acquisition of knowledge. The content of the student's independent work is determined by the work program of the discipline, the relevant methodological material, tasks and instructions of the teacher.

The student's independent work in this discipline is provided by appropriate information and methodological tools (textbooks, teaching aids, lecture notes, guidelines for organizing independent work and individual tasks), provided by the work program of the discipline.

In addition, for the quality organization of independent work of the student there is appropriate scientific and periodical literature. The student's independent

work on the study of educational material in a particular discipline can take place in the library, classrooms, computer classes and more.

The student is directly responsible for the quality of independent work.

TOPICS OF STUDENTS' SELF-TRAINING WORK (INCLUDING INDIVIDUAL WORK) OF DISCIPLINE "SURGERY"

№o/o	KIND OF WORK	HOURS	FORM OF CONTROL
1	Preparation for practical classes. Preparation and training of practical skills.	7	The current control on practical lessons
2	Working up of the topic, not included into thematic plan.	7	Independent written processing of the thopic. Defence of the written work.
	2.1 Penetrating and blunt traumatic injuries of liver, spleen, pancreas, stomach, duodenum, small and large bowel.		
3	Individual independent student's work	8	The current control on practical classes, defence of the history of disease
	3.1 Review of the scientific literature of your choice on the topic of the thematic plan of the discipline with a report in class		
	3.2 Participation in writing a scientific article on the topic of the thematic plan of the discipline with a report in class		
	3.3 Writing a medical history		
Total		22	

Information block

The abdomen can be injured in many ways. The abdomen alone may be injured or injuries elsewhere in the body may also occur. Injuries can be relatively mild or very severe. Doctors often classify abdomen injuries by the type of structure that is damaged and how the injury occurred.

The types of structures include the

- Abdominal wall
- Solid organs (that is, the liver, spleen, pancreas, or kidneys)
- Hollow organs (that is, the stomach, small intestine, colon, ureters, or bladder)
- Blood vessels

Abdominal injuries may also be classified by whether the injury is

- Blunt
- Penetrating

Blunt trauma -

may involve a direct blow (for example, a kick), impact with an object (for example, a fall onto bicycle handlebars), or a sudden decrease in speed (for example, a fall from a height or a motor vehicle crash). The spleen and liver are the two most commonly injured organs. Hollow organs are less likely to be injured.

Penetrating injuries -

occur when an object breaks the skin (for example, as a result of a gunshot or a stabbing). Some penetrating injuries involve only the fat and muscles under the skin. These penetrating injuries are much less concerning than those that enter the abdominal cavity. Gunshots that enter the abdominal cavity almost always cause significant damage. However, stab wounds that enter the abdominal cavity do not always damage organs or blood vessels. Sometimes, a penetrating injury involves both the chest and the upper part of the abdomen. For example a

downward stab wound to the lower chest may go through the diaphragm into the stomach, spleen, or liver.

Blunt or penetrating injuries may cut or rupture abdominal organs and/or blood vessels. Blunt injury may cause blood to collect inside the structure of a solid organ (for example, the liver) or in the wall of a hollow organ (such as the small intestine). Such collections of blood are called hematomas. Uncontained bleeding into the abdominal cavity, in the space surrounding the organs, is called hemoperitoneum.

Cuts and tears begin bleeding immediately. Bleeding may be minimal and cause few problems. More serious injuries may cause massive bleeding with shock and sometimes death. Bleeding from abdominal injury is mostly internal (within the abdominal cavity). When there is a penetrating injury, a small amount of external bleeding may occur through the wound.

When a hollow organ is injured, the contents of the organ (for example, stomach acid, stool, or urine) may enter the abdominal cavity and cause irritation and inflammation (peritonitis).

Complications of Abdominal Injuries

In addition to the immediate damage, abdominal injuries may also cause problems later on. These delayed problems include

- Hematoma rupture
- Intra-abdominal collection of pus (abscess)
- Intestine blockage (obstruction)
- Abdominal compartment syndrome

Hematoma rupture

The body is usually able to reabsorb collections of blood (hematomas), although it may take several days to weeks. However, a hematoma sometimes ruptures rather than being resorbed. Rupture can occur within the first few days after injury, but sometimes rupture occurs later, occasionally even months later.

Rupture of a hematoma of the spleen or liver can cause life-threatening bleeding into the abdominal cavity. Rupture of a hematoma of the wall of the intestine can allow intestinal contents to leak into the abdomen and cause peritonitis. Intestinal wall hematomas sometimes form a scar when they heal. This scarring can cause narrowing of the intestine at that spot that leads to intestinal obstruction, typically years later.

Intra-abdominal abscess

Abscess within the abdominal cavity may occur if injury to a hollow organ is not detected. Abscesses may also form after surgery to repair a serious abdominal injury.

Intestinal obstruction

Sometimes scar tissue forms after an injury heals or after surgery on the abdomen. That scar tissue forms fibrous bands (adhesions) between loops of intestine. Usually, these adhesions cause no symptoms, but sometimes another loop of intestine gets twisted under an adhesion. This twisting can block the intestine (intestinal obstruction) and cause abdominal pain and vomiting. Sometimes surgery is required to remove the adhesion and unblock the intestine.

Abdominal compartment syndrome

Just as a sprained ankle or broken arm swells, abdominal organs swell after an injury (particularly if there was surgery). Although there is usually enough room in the abdomen for such swelling, unchecked swelling ultimately increases pressure in the abdomen. The increased pressure squeezes the organs and restricts their blood supply, which causes pain and then organ damage. Such pressure-related damage is called abdominal compartment syndrome. It is much like compartment syndrome that can occur in the lower leg when injured by, for example, a fracture. Increased abdominal pressure may eventually also increase pressure in other body tissues, such as the lungs, kidneys, heart, blood vessels, and central nervous system. Abdominal compartment syndrome tends to develop in people with severe injuries or injuries that require surgery. Abdominal compartment syndrome is extremely serious and increases the risk of death.

Symptoms of Abdominal Injuries

People usually have abdominal pain or tenderness. However, pain can be mild, and the person may not notice or complain about it because of other more painful injuries (such as fractures) or because the person is not fully conscious (for example, because of a head injury, substance abuse, or shock). Pain from a [spleen injury](#) sometimes radiates to the left shoulder. Pain from a small intestinal tear is minimal at first but worsens steadily. People with a [kidney injury](#) or [bladder injury](#) may have blood in the urine.

People who have lost a large amount of blood may have signs of [shock](#), including

- A rapid heart rate
- Rapid breathing
- Sweating
- Cold, clammy, pale or bluish skin
- Confusion or low level of alertness

Blunt trauma may cause bruising (for example, people who were wearing a seat belt during a motor vehicle crash may have a bruise across the chest or the lower abdomen, called the seat belt sign). Not all people have bruising, and the presence of a bruise does not necessarily reflect the severity of the abdominal injury. In people with severe bleeding, the abdomen may be swollen because of the excess blood.

Diagnosis of Abdominal Injuries

- Imaging tests
- Urinalysis
- Sometimes, exploratory surgery

In some people, abdominal injury is obviously severe (such as many gunshot wounds). Doctors take such people directly to the operating room for

exploratory surgery and do not do tests to identify the specific injuries. However, most people with an abdominal injury require testing. The testing identifies the specific injury and, combined with the findings on the physical examination, helps doctors decide which people require an operation.

The main testing options include ultrasonography and computed tomography (CT). Ultrasonography can be done quickly at the person's bedside and is useful for finding severe bleeding. CT takes a little longer and requires moving the person to the scanner but gives more precise images. CT also can detect other injuries such as fractures to the spine or pelvis. Depending on the type of injury, x-rays of the chest or pelvis may also be needed.

Doctors also do urinalysis to detect blood in the urine, which indicates damage to some part of the urinary system. Usually a complete blood count is done so doctors have initial information to compare to later samples taken if the person's condition deteriorates.

Treatment of Abdominal Injuries

- Manage or reverse blood loss
- Sometimes, surgery or other interventions

People are given intravenous fluid as needed to replace blood loss. People who have lost a significant amount of blood are given [blood transfusions](#) .

Surgery may be needed to

- Repair damaged organs
- Stop bleeding

An alternative to surgery for ongoing bleeding is a procedure called angiographic embolization. In this procedure, doctors thread a large IV catheter up a large artery in the groin and into the bleeding vessel. Then they inject substances that block that vessel and stop the bleeding.

Although many injuries to solid organs, such as the liver and spleen, heal on their own, people with abdominal organ injury detected by CT or ultrasonography are hospitalized and examined every few hours to ensure that

bleeding stops and symptoms do not worsen. Sometimes CT or ultrasonography is repeated.

In all aspects of trauma management, the primary survey is the first priority

Primary survey

Airway with c-spine stabilisation (see chapter 1.3) Breathing (see chapter 1.4) Circulation assessment and management (see chapter 1.5)

Secondary survey

Perform a thorough back & front / head-to-toe examination for other injuries.

Abdominal Organs at risk

Solid organ injury - Liver, Spleen, Pancreas

Intestinal injury: -Stomach -Duodenum -DJ flexure -Small & large bowel

Genito-urinary injury -Kidney -Bladder -Urethra

Assessment

History

Patients at risk include those with:

- High impact / deceleration injuries;
- Direct blows to the abdomen;
- Evidence of injuries above and below the abdomen, suggesting the abdomen is unlikely to have been spared.
- Seat-belt injuries (duodenum or pancreas).
- Bicycle handlebar injuries to upper abdomen (duodenum or pancreas).
- Straddle injuries, astride a bar or beam (perineum, vagina or urethra).

- Penetrating injury to chest, abdomen or pelvis, especially if the entry and exit sites are above and below the diaphragm.
- Injuries suggestive of child abuse.

Examination

The abdomen of the frightened child is very difficult to assess. The best clinical yield of information occurs in the presence of the child's carers, and when every effort is made to help calm and relax the child with adequate explanations, reassurance and analgesia.

- Any signs of circulatory compromise, especially with a history suggestive of abdominal injury, should prompt assessment of the abdomen and pelvis as part of 'Circulation' in the primary survey.
- Marks, bruises or wounds to the abdomen. Look for specific signs, such as seat-belt or handlebar marks in the upper abdomen. Check front and back.
- Lap belt bruising
- Abdominal distension suggests blood, fluid, intestinal perforation or acute gastric distension.
- Abdominal tenderness significant, especially if over the liver, spleen or renal angles.
- Generalised guarding suggests peritonitis, usually a sign of massive bleeding or perforation.
- Pelvic instability or tenderness avoid repeated examination, which may cause blood loss.
- Blood at the urethral meatus suggestive of urethral trauma.
- Inspection of the back & perineum is essential, but needs to be explained and done calmly.

PR or PV examination is rarely required, and simply traumatises the child. Should only be considered if evidence of trauma to the area.

General management

Even where there is significant disruption of solid organs with haemodynamic instability conservative management is usually possible with adequate resuscitation.

Conservative management implies close and continuous observation, and is not the easy option. It should only be undertaken only in an institution where rapid access to surgical intervention is available at all times.

- ABCDE
- Fluid resuscitation with 20 ml / kg normal saline or Hartmans.
- Second bolus of fluid as above, if required.
- If further boluses of fluid are required, use blood.
- Immediate further SURGICAL review.
- Pass orogastric tube.
- All patients with free intraperitoneal air require a laparotomy.
- All penetrating wounds should be explored in theatre under general anaesthetic.
 - Intra-peritoneal bleeding is not an indication for laparotomy, so Diagnostic Peritoneal Lavage (DPL) has no significant role in children.
 - Children with a history of significant trauma or high impact trauma should be admitted for observation even in the absence of examination findings.

The vast majority of solid organ injuries (i.e. liver, spleen, pancreas & kidney) can be treated conservatively

Orogastric/Nasogastric considerations

Note the severe gastric dilation in this intubated patient, compromising the ventilation, who does not have an orogastric tube. Once the tube was passed the dilation resolved and the patient stabilized.

All patients undergoing CT scan should have an OG/NG tube prior to the investigation

1. This reduces the risk of vomiting while in CT,
2. It allows for oral contrast to be given, and
3. It protects against the risk of acute gastric dilatation.

Acute gastric dilatation can occur with relatively minor abdominal trauma

When in doubt, do not hesitate to place an orogastric/ nasogastric tube in cases of paediatric trauma. It should always be considered prior to transfer of the child with abdominal injury.

Acute gastric dilatation should also be considered in the differential diagnosis

Where a child has abdominal pain and distension associated with signs of shock following abdominal or major trauma. Even when the abdominal trauma may not appear severe in nature.

Investigations

- Bloods, FBC, lipase/Amylase & LFTs, Crossmatch, BM
- Urine analysis: All abdominal trauma patients should have urine analysis done.
- CT scan is the imaging modality of choice. Intravenous contrast, preferably supplemented by simultaneous oral contrast, is essential. Patients must be stable enough to move to CT scan.
- X-ray. Only require supine and decubitus lateral / right-side-up abdominal X-rays if there is a suspicion of intestinal perforation.
- U/S. This can be used for imaging of solid organ injury but a CT scan remains the gold standard .It can also be used to see if there is free fluid in the peritoneal cavity. However, a negative study does not rule out injury.
- Fast U/S . Is not routinely undertaken in the paediatric setting. This is because evaluation of the fluid volume present in the abdomen can

be difficult and ultimately the presence of blood is not an indication for surgery. The need for a laparotomy in blunt abdominal trauma cases, as previously stated, relates largely to clinical response to aggressive resuscitation and the nature of the organs injured in the trauma.

- IVP. Can be used to assess renal trauma but the kidney can usually be assessed with IV contrast at the time of CT scan.

Specifics of the injury of organs

Spleen

- Isolated splenic injury in almost all cases can be managed conservatively with resuscitation and close observation.
- Patient care involves

Acute

I.V. access with aggressive initial resuscitation with IV fluids,
Cross-matching blood,
Regular nursing observation,
Continuous monitoring (possibly in High dependency unit)
Repeated clinical examination

Ongoing

Bed rest until pain settles
Length of stay related to clinical stability, and the resolution of signs and symptoms.

Follow-up repeat ultrasound scan may be undertaken at 3 months but not essential if clinically well.

Splenic rupture

Indications for laparotomy

- Haemodynamic instability - despite resuscitation.

- Transfusion requirements of more than 40 ml / kg during the period of acute resuscitation

Late problems

Late rupture. This is a risk, but there is no clear evidence of it being linked to insufficient bed rest, or to returning too early to unrestricted activity. The adult literature suggests that late rupture occurs in about 6% of patients. However, it is only rarely reported in children. Healing of the spleen can be documented radiologically on ultrasound, and appears to correlate closely with the severity of rupture. Studies in Pittsburgh have shown that healing takes from 3 weeks in minor splenic injury, to 20 weeks for a severely shattered spleen. However, it is not known whether this constitutes full physiological healing, or how it relates to late rupture.

1. A sensible protocol is strict bed-rest until the abdominal pain subsides, followed by restricted activity for 3 months, followed by return to full activity. (Though some reports suggest 6 weeks may be sufficient)
2. The most important issue is to brief the parents fully on the risks of late rupture, and the need to return to hospital urgently if symptoms of pain or collapse occur.

Delayed rupture can still be treated conservatively, following the same protocol as the acute injury.

Loss of splenic function: Studies in adults demonstrate that approximately one-third of the spleen is needed for normal immunological function³. Assess the percentage of spleen remaining on the initial CT scan, and repeat the splenic ultrasound. Look for Howell Jolly bodies on blood film. If suspicious, immunise & start on oral Pen V.

Liver

At least 80% of blunt liver injuries can be treated conservatively

- Conservative management involves aggressive resuscitation and close observation as previously detailed.

- When fluid resuscitation exceeds 40mls/kg in 2 hrs with ongoing instability surgical intervention must be strongly considered.
- Unlike surgery for splenic trauma, surgery on the injured liver is complex, with a high morbidity and mortality.
- If stability is obtained considered opinion recommends transferring the child to a dedicated paediatric trauma service for close monitoring and obtaining a CT scan.
- If the patient is too unstable to transfer, a laparotomy with packing of the liver is all that should be attempted before transfer.
- CT scan with intravenous contrast is ideal if the surgeon is to have any chance of identifying the problem at the time of laparotomy.
- There remains a risk of late bleeding from the injured liver €" a suggested plan for those with a major injury is of strict bed rest until the abdominal pain settles. Then with restricted activity for a further 3 months.

Late problems Continued Bile Leak evidenced by

- Slowly increasing abdominal distension,
- Rising bilirubin
- Ultrasound evidence of increasing ascites

Investigations include a HIDA isotope scan, ERCP and repeat ultrasound scan. A continued bile leak may be treated conservatively with intraperitoneal drainage of the collection, and stenting of the common bile duct.

Pancreas

Conservative management

With acute resuscitation and pain management.

Routine oral intake is withheld until resolution of symptoms and normalisation of amylase and lipase

Nasogastric drainage with possible NJ feeds or TPN may be required depending on severity.

Where there has been significant trauma a CT scan should be performed to assess the pancreas. Specifically transection of the pancreas should be looked for raising the possibility of duct transection.

If a duct injury is suspected a ERCP can be performed in an older child and possible stenting of the duct considered.

If distal duct has been transected and stenting is not possible then an early distal pancreatectomy should be considered. Conservative treatment can be undertaken but recovery from this injury is slow with associated morbidity.

Note: There is no indication for urgent laparotomy.

Pancreatic injury

Late problems

Pseudocyst formation. Symptoms include continued or worsening abdominal pain or increasing nausea and vomiting. If there is concern then an amylase/lipase along with ultrasound scan should be performed. Pseudocysts may be treated conservatively though some form of drainage procedure may be necessary if the cyst continues to enlarge. Drainage usually involves a cystgastrostomy procedure which can be accomplished as an open, laproscopic or radiological procedure depending on expertise.

Intestine

Intestinal injuries are uncommon

- Those that do present are often associated with:
- Rapid deceleration injuries €" causing shear injuries at the DJ flexure, the terminal ileum, caecum or sigmoid colon.
- Abdominal crush injuries "injuries occurring in up to 50% of cases where a lap seat belt is involved.
- Penetrating injury - which may cause damage to more than one loop of bowel.
- All these mechanisms of injury demand a high index of suspicion of intestinal injury.

Diagnosis is often delayed.

Plain X-ray or CT scan with presence of free air may suggest intestinal injury, but are not always reliable indicators. Regular clinical evaluation, including auscultation for bowel sounds, associated with repeat x-rays, may be necessary to make the diagnosis.

If there is injury to the mesentery and devascularisation of the associated bowel, associated perforation may appear only some days after the original injury.

Evidence of free intra-peritoneal gas is an indication for urgent laparotomy.

Duodenum

Acute duodenal injuries

- Should be suspected on a history of bruising in the epigastrium, severe epigastric tenderness or bilious vomiting
- Are often associated with pancreatic injuries
- Are particularly associated with bicycle handlebar and seat belt injuries

Injuries may take the form of

- Intramural haematoma without perforation
- Rupture of the duodenum

Duodenal intramural haematoma can be seen on CT scan, and confirmed - if necessary - on upper GIT contrast study. It may also become apparent if there is ongoing obstruction post-trauma. This can be treated conservatively with nasogastric drainage, but may take up to 3 weeks to resolve. TPN will be required over this time.

Acute duodenal perforation

- needs to be a diagnostic consideration at initial presentation

- It can be detected by presence of free air. This air may be retroperitoneal, rather than intra-peritoneal See X-Ray withground glass appearance

- It may also be detected by extravasation of contrast on an upper GI contrast study or CT scan

- Perforation can be delayed if there is an area of devascularisation with the trauma

- Acute perforation is treated with laparotomy

- Late presentations may be managed conservatively with NGT, TPN & antibiotics

Kidney

Aspect injury from

1. History
2. Wounds
3. Bruising in the renal area
4. Frank or microscopic haematuria

Investigations

All abdominal trauma patients should have urine analysis done. Careful monitoring of urine output, with further investigation if microscopic haematuria is seen. If the patient is relatively well, ultrasound is the simplest way to image the kidney. However, CT scan with iv contrast is again the investigation of choice, and will give evidence of renal function.² IVP is irrelevant if a CT scan has been done.

Management

Most sharp and blunt renal injuries can be treated conservatively. Antibiotics should be given to patients with renal trauma, and then continued at a prophylactic dose until the injuries have healed.

Indication for laparotomy

On-going blood loss despite resuscitation. The majority of explorations will lead to a nephrectomy.¹

Late problems

Continued haematuria secondary to an AV fistula. Some of these injuries can be managed by selective radiological embolisation. Patients with significant injury should be followed up with repeat ultrasound scan and DMSA scan, to assess renal function at 3 months. Patients with persistent renal damage are at risk of hypertension, and should be followed up for at least 1 year.

Bladder

Suspect injury from

- Patient's history. Bladder injuries typically present after: - Deceleration injury. - Blow to the lower abdomen when the bladder is full.
- Bruising in the suprapubic region.
- Evidence of urine extravasation (oedema of the scrotum, lower abdomen and upper thighs),
- Blood at the external urethra.
- Extraperitoneal extravasation or intraperitoneal rupture.
- Failure to pass any urine.

Management

- Urinalysis,
- Monitoring of urine output
- Ultrasound scan may give clues to the diagnosis.
- CT scan with iv contrast is the investigation of choice.

Laparotomy

Should be reserved for intraperitoneal rupture.

If there is any evidence of damage to the bladder neck, insertion of a suprapubic catheter under ultrasound guidance with referral to a paediatric urologist is the safest course.

Urethra

Suspect injury from

- Straddle injury, a fall astride a beam (e.g. the bicycle frame);
- After pelvic fractures.
- Blood at the meatus, or a high riding prostate in older boys, is a classic sign of urethral trauma in boys.

Serious further injury can be caused by inappropriate attempts at urethral catheterisation

Management

- Investigations include a CT with contrast and an ascending contrast urethrogram.
- If there is evidence of injury, the child should be referred to a paediatric urologist.
- If bladder drainage is needed prior to transfer, a suprapubic catheter should be inserted under general anaesthetic with ultrasound guidance. This is because the bladder anatomy can be seriously distorted by pelvic fractures and extraperitoneal haematoma

External genitalia

Suspect injury

- External genitalia damage has the same origins as urethral injuries.
- Child abuse should also be kept in mind

Management

Lacerations to the perineum can usually be simply stitched in theatre.

If abuse is considered a possibility, contact the Child Protection services prior to anaesthetic. This is necessary so that consent is correctly obtained for examination under anaesthetic, and for photographic evidence to be taken in a manner later admissible in court.

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