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# Non Operative Management of Blunt Abdominal Trauma

## 1. Liver Injury

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### Abstract:

During the past 3 decades, non-operative management (NOM) has been demonstrated to be an effective therapeutic option in hemodynamically stable patients. We retrospectively reviewed our experience of the last 7 years in NOM of blunt abdominal trauma. Between January 1998 and July 2005, 123 patients with blunt abdominal trauma and injury to liver, spleen and pancreas were admitted to our hospital. Fifty-eight of them (47.2 %) were submitted to NOM; 5 (8.6 %) sustained both hepatic and splenic injuries. We treated nonoperatively 32 hepatic injuries (62.7 % of the total hepatic injuries) 27 splenic injuries (33.7 % of total splenic injuries) and 3 pancreatic injuries (75 % of the total pancreatic injuries). There were no mortality and no complications. We submitted to angiography and embolization one patient with a grade V hepatic injury, hemodynamically stable, showing a "contrast pooling" at abdominal CT scan; the patient was successfully managed nonoperatively. The overall success rate of NOM was 98.5 %; the only NOM failure was a patient with both splenic and hepatic injury. Success rate for injuries to the liver was 96.9%, spleen was 96.3%, and to the pancreas was 100%. We conclude that hemodynamically stable patients sustaining intra-abdominal injury can be safely managed non-operatively.

**Words Key:** Blunt Abdominal Trauma, non-operating management.

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### Introduction:

The non-operative management (NOM) represents the therapeutic strategy of choice in patients with blunt abdominal trauma of the hemodynamically stable patients.<sup>1-3</sup> After a suitable diagnostic course, that presupposes a correct "mapping" and "grading" of possible lesions to the parenchymal organs, the NOM is suitable, as already said, provided that the hemodynamic parameters are stable and in the absence of peritoneal reactivity and of great retroperitoneal lesions or of other districts that require an immediate surgical intervention; however, it is, only, feasible if there is the possibility to program a suitable clinical monitoring [laboratory]-instrumental and, above all, to perform an immediate surgical intervention provided that failure.<sup>4</sup> The advanced age (55 years), patient with an altered mental status due to severe brain injury, and presence of large hemoperitonum (>500cc), does not represent un absolute contraindications,<sup>5-8</sup> although in most of the experiences in literature these conditions are associated with high rate of failure of (NOM). Selective use of arteriography with or without

embolization can increase the number of patients candidates to the (NOM), that improve the rate of success, even if their indication is under discussion.<sup>9, 10</sup> In particular angiography was performed for hemodynamically stable patients with injuries showing signs of bleeding, on diagnostic CT (contrast extravasation or solid organ injury classified, according to the American association for the surgery of trauma, as grade MI or higher on computed tomography). Some other authors advice, its usefulness even in patients hemodynamically unstable; who are in hemorrhagic hypotension; if their hemodynamics parameters are improved by resuscitation with 2 L of fluid (10). Further studies will be necessary for its results and exact indications. The rate of success of the (NOM) of blunt abdominal trauma; in case of splenic injuries is almost 100% in paediatric patients<sup>11</sup>; and 60-80 % in the adults<sup>12</sup>; and about 85-100% in case of hepatic trauma.<sup>13</sup> We will discuss our experience in the non-operative management of blunt abdominal trauma of the last 7 years.

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### Patients and Methods:

During the period from January 1998 to July 2005, 123 patients with blunt abdominal trauma were admitted to observation in our department of general surgery; the first evaluation of all patients has been lead in the respect of the diagnostic-therapeutic priorities of the ATLS; in particular, all have been admitted in the emergency room (ER) of department of causality; to chest Rx, pelvic Rx and FAST echography (Focused Assessment with Sonography for Trauma).<sup>14</sup> If instability of hemodynamic parameters at admission and positive FAST echography for hemoperitonum were present, the patients have been submitted immediately to laparotomy in regime of emergency. All patients with initial stability of the hemodynamic parameters or with rapid hemodynamic responds to the initial fluid bolus of crystalloids (2000 cc of Ringer lactate) have continued the diagnostic course by total body spiral CT with contrast media, CT of head & cervical spine and other skeletal x-ray depends on the mechanism of trauma, when suitable, at the end of the diagnostic course the patients have been re-evaluated depending on the clinical finding of the primary assessment; in case of hypotension and tachycardia, due to severe intra-abdominal organ injuries, and associated hemoperitonum, we have proceeded to surgical intervention; in the presence of stability of hemodynamic parameters the patients were destined for non-operative management (nom). According to our protocol, in the these circumstances, we followed the hourly monitoring of the blood pressure (BP) and urinary output, complete blood count (CBC) every 6 hours in the first 24 hours, and every 12 hours in the successive 24 hours, and bedside abdominal ultrasound (US) every 12 hours for the first 24-48 h, based on the gravity of the organ injury, and daily in the following 2-3 days. The abdominal CT scan with contrast media, if there is no contraindication, its repeated 1 week after the trauma. The severity of lesions of parenchymal organs of the abdomen has been determined in accordance with the up-to-date classification of Moore et al of the 1995.<sup>15,16</sup> Only in the course of the last year we have introduced in our protocol of management of multiple trauma patients, (specifically those with blunt abdominal trauma) the use of arteriography with or without arterial embolization. This type of treatment was performed exclusively in case of stability of hemodynamic parameters and in selective case of intra-abdominal bleeding. 123

patients with blunt abdominal trauma have shown a documented lesion to the liver, to the spleen or to the pancreas. Sixty-five patients (52.9 %) have been submitted to surgical intervention in regime of emergency-urgency, because of;

- a) hemodynamic instability.
- b) Positive results of (FAST) .abdominal, ultrasound & abdominal CT scan. (hemoperitonum & associated others lesions).

In particular, we performed:

- a) 53 splenectomies .
- b) 19 interventions on the liver (7 resection & debridement; 8 hemostasis of bleeding through hepatorrhaphy; 4 packing).
- c) 1 splenectomy and distal resection of tail of pancrease.

In 8 patients splenectomy and hemostatic procedures on the liver have been contemporarily performed .

Fifty-eight (58) patients (47.2 %) were hemodynamically stable, (with injuries to the liver, spleen, and /or pancreas) and were admitted to clinical & strumental monitoring, making the program of (NOM) of blunt abdominal trauma be possible.

Five (5) patients presented simultaneously with injuries to the spleen and to the liver (8.6 %).

During the period of (1998-2005) the evaluation of our therapeutic attitude toward postraumatic injuries of intra-abdominal organs, has changed in the favour of the (nom), when indicated, and the percentage of blunt abdominal trauma raised from 3 % in the 1998 to 63% in 2005.

None of the submitted patients to (nom) had presented with cerebral lesions and all were co-operative during the clinical and instrumental monitoring.

### Results:

Out of the 51 lesions of the liver admitted to our observation, 32 (62.7 %) have been treated in non-operative way (Fig. 1); the mean age of submitted patients to NOMLI (Non-operative management of liver Injuries) was resulted of 26.5 years (range from 17-70 years), the males were 17 (53.1 %) and the females 15 (46.9%). According to American association for the surgery of trauma, computerized axial tomography scan grading, the hepatic lesions were as shown in (Table 1, 2).

**Table 1: The hepatic lesions grades according to the American Trauma surgery association.**

|           |       |          |
|-----------|-------|----------|
| Grade I   | 18.8% | (n = 6)  |
| Grade II  | 25.0% | (n = 8)  |
| Grade III | 50.0% | (n = 16) |
| Grade IV  | 3.1%  | (n = 1)  |
| Grade V   | 3.1%  | (n = 1)  |

A 16-years-old girl who had sustained grade V hepatic injury was submitted to observation for stability of her hemodynamic state after 3 hours, from the beginning of the observation; her general condition deteriorated (hypotension, tachycardia, rapid & shallow breathing), the abdomen became moderately distended with no audible peristalsis. However, she responded to another bolus of fluid

(colloids and crystalloids) and to the administration of 3 units of blood. Since the abdominal CT at admission had shown a slight leakage of contrast media, from hepatic lacerations, the patient was submitted to angiography: the examination documented the presence of active bleeding from 2 arterial branches of the hepatic lobe, which were subjected hepatic embolization procedures. This procedure prevented has avoided the failure of the (nom) and the patient was discharged after 8 days from the trauma without complications (Fig. 1). Non of these patients with blunt hepatic trauma, treated conservatively (nonoperative), has develop complications correlated to the liver injury (like biliary fistola, bilioma, perihepatic abscess or hemobilia).

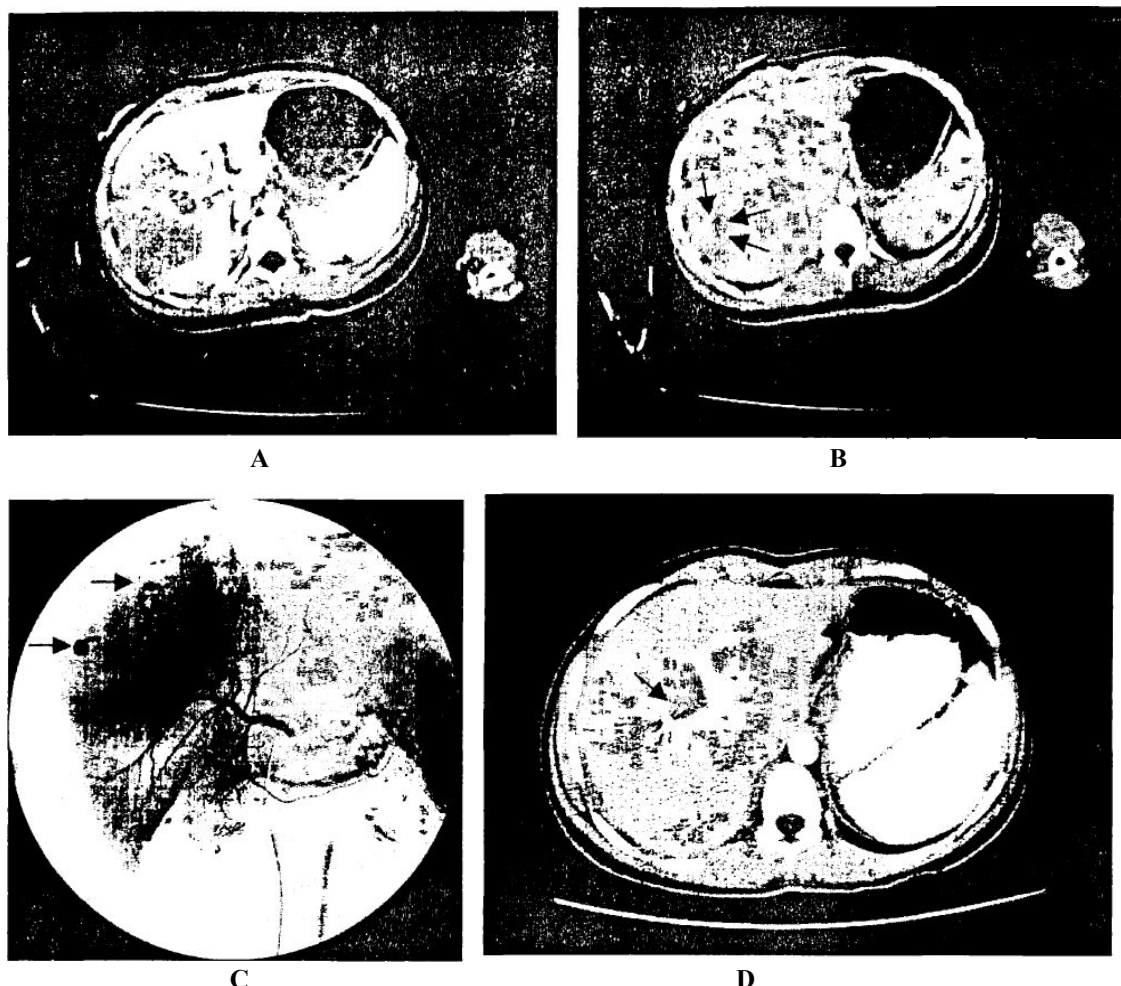
**Fig. 1:** A 16 years-old girl, admitted to our department with history of road traffic accident;

**Fig. 1A.** abdomen CT scan at admission, (arterial phase): shows large intra-hepatic hematoma (rupture of Glisson capsule. (liver trauma grade V)

**Fig. 1B.** abdomen CT scan at admission, (venous phase): It shows extravasation of contrast media inside the hematoma & peri-hematoma.

(type III of Fang (arrow));

**Fig. 1C.** arteriography: it shows evidence of peripheral arterial bleeding which are embolized (arrow);

**Fig. 1D.** abdomen CT scans; 3 months after the trauma, the liver lesion is perfectly resolved and the hematoma is reabsorbed; the spirals of the performed embolization are visible (arrow).

**Table 2: Organ Injury Scaling – Liver.**

| Grade | Injury     | Description                                                                                          | AIS-90 |
|-------|------------|------------------------------------------------------------------------------------------------------|--------|
| I     | Haematoma  | Subcapsular, <10% surface area                                                                       | 2      |
|       | Laceration | Capsular tear, < 1cm parenchymal depth                                                               | 2      |
| II    | Haematoma  | Subcapsular, 10-50% surface area                                                                     | 2      |
|       | Laceration | Intraparenchymal, <10 cm diameter                                                                    | 2      |
|       |            | 1-3cm parenchymal depth, <10 cm length                                                               | 2      |
| III   | Haematoma  | Subcapsular, >50% surface area or expanding. Ruptured subcapsular or 3 parenchymal haematoma         | 3      |
|       | Laceration | Intraparenchymal haematoma >10 cm or expanding                                                       | 3      |
|       |            | >3cm parenchymal depth                                                                               | 3      |
| IV    | Laceration | Parenchymal disruption involving 25-75% of hepatic lobe or 1-3 Couinaud's segments in a single lobe  | 4      |
| V     | Laceration | Parenchymal disruption involving >75% of hepatic lobe or >3 Couinaud's segments within a single lobe | 5      |
|       | Vascular   | Juxtahepatic venous injuries ie. retrohepatic vena cava/central major hepatic veins                  | 5      |
| VI    | Vascular   | Hepatic Avulsion                                                                                     |        |

### Discussion:

The non-operative management (nom) of the blunt abdominal trauma is considered, in the course of the last 3 decades, the therapy of choice in the hemodynamically stable patient.<sup>1-3</sup> This therapeutic attitude had been proposed in 60 years ago by pediatric surgeons in the management of traumatized paediatric patients with splenic injury, and it emphasized the importance and possibility of preserving or the injured spleen, and in such a way, decreased the incidence of the post-splenectomy sepsis syndrome (PSS), is considered as a fatal complication.<sup>15</sup> The results, in terms of

"preservable" spleens and, then, avoidance of the surgical intervention have proved very encouraging,<sup>16,17</sup> and in short of time, this attitude of non-operative management was extended, with the same successful rate of management of traumatized pediatric patients with hepatic injury.<sup>18,19</sup> The application of principles of the (nom) in the blunt abdominal trauma of adults proceeded more slowly. We should remember that, Tellmans in 1879, on his experimental observations on animals, had already described the spontaneous arrest of the liver hemorrhage after blunt abdomen.<sup>20</sup>

Subsequently some surgeons mentioned that that the spontaneous arrest of the postraumatic liver hemorrhages was not a rare event, that was found at time of laparotomy.<sup>21</sup> The first half of the last century witnessed the conviction that the urgent laparotomy was seen an absolute indication in the management of blunt abdominal trauma for purpose of precise localization & evolution of possible organ injuries, and for correct surgical therapy of the case. Pringle,<sup>22</sup> in fact, excluded the possibility of a spontaneous hemostasis of secondary hepatic hemorrhage due to a laceration of a certain entity, and excluded the spontaneous resolution of any parenchymal liver injuries. Furthermore, he emphasized that the surgery presented the only possible modality of treatment and that mortality rate in the non-operable cases, reached 70-80% in the liver injuries, and 100% in the splenic injuries.<sup>23</sup>

The improvement of the ability the effectiveness of surgeons in the treatment of post-traumatic hepatic and/or splenic injuries, that verified during the II world war, and the consequent improvement of the mortality rate of the liver and splenic trauma, favoured the surgical treatment to remain, the therapy of choice of blunt abdominal trauma.<sup>20</sup>

Then from the '60 years, however, any critical considerations take place was common<sup>24</sup>: about one third (1/3) (until 67 % in any experiences) of urgent laparotomies it resulted "uneffective or unnecessary", because at the time of laparotomy, the most intra-peritoneal bleeding was found arrested spontaneously, and did not require any hemostatic treatment; by means of surgeons, the complications rate after any surgical intervention remained, and also elevated, lastly, the laparotomy itself recognized as a negative factor in respect of the physiopathology in the postraumatic patients. These observations and the good results obtained from the pediatric patients argued in the favour of the application of the (nom) in the management of blunt abdominal trauma in the adults. The development, also, of the modern imaging apparatus "like spiral CT scan and multislide CT scan" which are characterized by a sensitive shortening of the operating times, has allowed, in urgency, to appraise with extreme accuracy the presence and the gravity of lesions of organ without opening the abdomen; its diagnostic value decreases the number of indications for a surgical approach.

The numerous experiences of (nom) since the 1980s, in terms of the above excellent

successful rates, represent a dramatic divergence from the traditional surgical dogma, which had been in use, and mandates delineation of those patients at risk of failure of (nom). Today approximately the two thirds of the patients with splenic injuries and 70-90% of the hepatic injuries, which are hemodynamically stable, do not require to surgical intervention.<sup>25</sup>

Concluded till this point that; not to propose as a candidate to the (nom) a patient with lesion of liver or of spleen after blunt abdominal trauma is the stability of hemodynamic parameters<sup>26,27</sup> and particularly important to distinguish the patient who is "hemodynamically normal" from the patient who is "hemodynamically stable": the stability is, in fact, a dynamic concept, that takes account of the evolution, or better than the not evolution, in terms of hemodynamics parameters.

The hemodynamics stable patient can be persistently tachycardiac, tachypenic and oligouric, remain clearly dehydrated and in state of hypovolemic shock, while the hemodynamics normal patient does not show any signs of inadequate tissue perfusion. Therefore, the presupposition of the stability of hemodynamic parameters also implies their normality or, at least, their return to the normal value within a short period.<sup>27</sup>

Furthermore, the response of the traumatized patient which who show the signs of a hemorrhagic shock (tachycardia, pallor, hypotension, signs of inadequate perfusion of the organs to the initial infusion bolus of crystalloids (2000 cc of Ringer lactate), represents another important factor in determining the more suitable therapeutic attitude. According to the guide-lines of the ATLS,<sup>27</sup> in fact, the politraumatized patients who are characterized with hypovolemic shock, can show three types of different response, to the initial fluid therapy;

- a) rapid response; which is characterized by rapid return to the normal hemodynamic parameter and remains stable with infusion of fluid in the maintenance manner;
- b) transit response; which is characterized by some initial improvement of hemodynamic parameters, and then starts to worsen, when the i.v fluid is decreased to the maintenance dosages, which indicates that there is continuous active bleeding;
- c) Finally, an absent response, which is characterized by the worsening of the

hemodynamic condition of the patient, and persistence in hypovolemic shock situation, which announces the presence of a profuse hemorrhage and that requires an immediate surgical intervention.

Ultimately, then, the patients with post-traumatic lesions due to blunt injuries, to the liver, spleen, and pancreas, which are candidates to the (nom) are those who present with (stable hemodynamic parameters) and those patients who show stable hemodynamic parameters.<sup>4,26,27</sup> Moreover, they should not have any peritoneal reactivity, or any signs of associated intra-abdominal lesions, or other major injuries of other part of the body which require an immediate surgical treatment, not less important, there is the possibility to perform accurate clinical and instrumental and laboratory evaluations of the patients, and also the possibility to perform an immediate surgical intervention at any time in case of failure of (nom).<sup>4,26,27</sup>

Some conditions, as like a patient with age more than 55 years, presence of associated neurosurgical lesions, very elevated grade of organ lesions (IV-V for the spleen, and IV-V-VI for the liver) and estimated amount of haemoperitoneum is in excess 500 cc, were considered, in the past, as exclusion factors for non-operative management of intra-abdominal solid organ injury, but recent experiences have brought excellent successful rates of the (nom), also in these conditions are not considered as an absolute contraindication.<sup>5,7</sup>

In patients with age more than 55 years, in fact, Myers et al<sup>28</sup> have brought a successful rate of the (nom) of 94%, and Cocanour et al of 83%.<sup>29</sup>

In the past, the neurological status of the patient was considered as one of an important factor for selection of candidates to the (nom) because of immediately in the post-traumatic observation period it affects the course of clinical evaluation of the patient and gives false interpretation of objective abdominal examination, for these reasons, the patients with neurological lesions were excluded primarily from the (nom) protocol.

Some authors have shown that the patient with an altered mental status does not increase the rate of failure neither of the mortality rate of the (nom); Archers and Rogers,<sup>7</sup> in particular, have brought a successful rate of 100% in 30 patient with blunt abdominal trauma with an altered mental status, and Brasel et al<sup>30</sup> they

have shown no difference in the rate of failure of the (nom) in patient with blunt abdominal trauma, with GCS (Glasgow Coma Scale) more or less than 13.

With regard to the gravity of the lesion of organ and estimated amount of hemoperitoneum, it has been considered as an exclusion factors for the (nom), also with lesions with the same or more than IV grade organ lesions; and in the presence of the more than 500 cc of hemoperitoneum. even if these conditions, are near of the truth, are characterized by high risk of failure of (nom) protocol.<sup>31,32</sup>

Also, in our experience we managed non-operatively with successfully, 3 patients, with high grade organ lesions (5.1 %), 2 with hepatic injuries (1 with IV grade and another with V grade) and 1 with splenic injury (of IV grade), and none of these cases failed in the course of their management.

A suitable monitoring regimen, for the patient with blunt abdominal trauma, submitted for nom include<sup>1,4,24</sup>:

1. continuous ECG monitoring (for the first 24-48 hrs);
2. positioning of urinary catheter with hourly monitoring of the diuresis;
3. continuous monitoring of the blood pressure ;
4. continuous monitoring of the heart rate ;
5. complete blood count (cbc) examinations, every 2 hours until that the values have stabilized, and then every 12 hours;
6. abdominal- pelvic ultrasound . every 6-8 hours in 24-48 hours.

With regard to the indication of an another abdominal CT scan at 48 hr, after trauma, as routine investigation; today most of the authors<sup>33</sup> highlight it's utility only for patient with high-grade organ injuries, of the liver or spleen trauma;

Ciraulo et al.<sup>34</sup> in 1996, emphasized that, no significant difference was demonstrated, and no patients failed non-operative treatment or succumbed to their injuries, finding on repeat CT scan did not alter the decision to discharge the clinically stable patient having suffered a grade III or lower liver injury. Thus we understand from above repeated CT scan is indicated only in the high-grade organ injuries. According to Pachter and Feliciano,<sup>35</sup> the diagnostic accuracy the abdomen CT scan was 97-99%, did not substitute the continuous clinical re-evaluation of the patient condition . In the early days of our experience, the

abdominal CT scan control at 48 hours after trauma, was considered as an important parameter for monitoring protocol, but the following experience has shown that, its routine execution is not indicated (exaggerated), as did not add any information, to obtained by the use of ultrasonographic (us) monitoring.

Instead, the abdominal CT scan, can be repeated at any time when clinical evaluation demonstrates:

- a) progressive deterioration of haemoglobin.
- b) Appearance of abdominal signs (tenderness, distension, rigidity. etc).
- c) Unexplained fever.
- d) And, if the ultrasonography document a progressive increase in the hemoperitoneum.

The persistence or the appearance, during the period of monitoring, of hypotension, tachycardia, oligo-anurea and progressive falling of haematocrit and values of haemoglobin associated to the increase in the amount of hemoperitoneum, which is documented by US, (particularly in the peri-hepatic, peri-splenic areas, and in Douglas cavity) represent an absolute indication for CT scan for exclusion from the (nom) protocol.

During the period of observation, it's important to emphasize again, the need of blood transfusion, which is relatively a frequent event, and with a media of 2-4 units. Most of the authors,<sup>36-38</sup> in fact, reported the need for of more than 4 units of blood to maintain the hemodynamic parameters stability.

With regard to the liver, this organ is more commonly involved in the (BAT) blunt abdominal trauma, and the prevalence of liver trauma has increased in the last 3 decades;<sup>39,40</sup> it's still not clear, however, if such increases, is a true event or only reflect the improvement of the diagnostic facility which used at the admission of the patients.

The global mortality rate for liver trauma has decreased from 70-80 % at the 1<sup>st</sup> decades of the century to 10-20%,<sup>41</sup> and these results are tightly related to the gravity of the lesion, the presence of associated intra & extr- abdominal injuries, the interval time between the occurrence of the trauma, and the hospitalization of the patient, to the rapidity of the diagnosis, and finally to the speciality competence of the surgical team.

Today until 80-90 % of blunt liver traumas it became managed non-operatively and most of the recent publications demonstrate that, the principle benefit of the (nom) is represented in the avoidance of the urgent intervention. Richardson et al.<sup>39</sup> have shown that, the (nom) have allowed also a real improvement of the global mortality rate for liver trauma.

The successful rate of the (nom) of blunt liver trauma, (for paediatric & adult patients) is elevated in the most recent literatures between the 85 and 100%.<sup>13,23,39,40</sup>

The indication of urgent surgical intervention due to haemorrhage during the (nom) of the post-traumatic injuries of the various hepatic lesions, is range 5 to 15% of the cases. Concomitant occult enteric injuries with solid injury. have an incidence of about 1-3% and represent a continuing challenge to the clinical acumen of the trauma surgeons.<sup>42</sup>

Among the patients who are initially treated non-operatively, there are variable percentage between 10 and 25% who develop certain complications, related directly to the liver trauma,<sup>43</sup> such as arteriovenous fistulas, bile leaks, intra-hepatic or peri-hepatic abscesses and abnormal communication between the vascular system and the biliary tree (hemobilia and bilhemia) and finally abdominal compartment syndrome.

One of the more recent experiences on the incidence and on the treatment of such complications has been reported by Goldman et al.<sup>44</sup> in 2003: the authors, demonstrate, in fact, that 12% of their liver trauma patients submitted to the (nom) has developed of specific liver complication, 79% of these complications have required delayed surgical interventions.

An interesting data or finding, of their analysis is represented by the mortality rate of the patients, submitted to non-operative management; in fact the global mortality rate has been 1.3%, but the two deaths were related to complications of bile leak secondary peritonitis. The mortality rate among the complicated patients was therefore, of 10.5%. Such findings must be kept in consideration, although these finding do not negate non-operative management of the liver injury, and this approach can be hazardous and require

diligence to recognize and management of delayed and fatal complications.

We should emphasize that the (nom) is the treatment of choice for blunt hepatic trauma, it is necessary to select and/or exclude the patients, particularly which at risk for development of complications.

Most of the complications which can appear later, during the (nom) can be managed, however, with "non-operative method" by transcutaneous drainage, or ERCP procedures.

In our experience the successful rate of the (nom) in the treatment of liver lesions has been of 96.9%, this results is considered as encouraging result because about 65% of the our patients, which observed with liver lesions, has been proposed as a candidate to (nom), and about 7% of these patients are not submitted to the protocol due to severe lesions, are not demonstrate however, specific hepatic related complications, neither misleading occult enteric injuries.

#### Conclusions:

All hemodynamics stable patients, with injuries to parenchymal organs of the abdomen after blunt trauma, must be considered candidates to the (nom), after carful studied by ultrasound and abdomen CT with contrast media.<sup>1-3,26,27</sup> Even if the CT is today capable of appraise carefully the lesions of organ, it is not able to indicate exactly there patients who require the laparotomy; for this reason, all patients submitted to the protocol of (nom) monitoring, it must remain under clinical re-evaluations, laboratories and instrumental workup, with the surgeon and its team ready to intervene immediately, in case of deterioration of hemodynamics parameters or at the time of the appearance of complications that require a surgical treatment. Though a delayed bleeding by the liver appear extremely rare (2 %), a bleeding in two times of the splenic lesions is an event not unusual, so that the patients with splenic lesions must be submitted to a more careful and accurate instrumental (us) evaluation, also by abdomen CT after 48 hours from the trauma in cases of more serious lesion. The successful global rate of the (nom) for patients with various hepatic injuries ranges from 85 to 100%<sup>13,23</sup> while the success in the splenic lesion ranges from 60 to 75%.<sup>12</sup>

The experience of the large American trauma centers has shown that the incidence of undiscovered injury to the intra-abdominal

organs ignored, though dangerous event for the greater rate of morbidity and mortality of which it causes. It has been shown that there are general decreases complication among adults and paediatric patients treated non-operatively; and in event of appearance of abdominal pain and associated with distension, and episodes of vomiting, and signs of peritoneal reactivity, that can represent a precocious signs of this complication, they must be therefore carefully re-examined & re-evaluated of these patients for determination of their general condition by the surgeon. The arteriography with possible arterial embolization has shown to be very useful in patients with blunt abdominal trauma who are hemodynamically stable, and has increased the number of the patients who are candidates to the protocol of (nom) and the successful rate of the (nom) program.<sup>9,10</sup>

In case, however, of failure of the (nom), the surgery remains to be the therapeutic choice method for the traumatized patient and offer, a wide variety of strategy and of therapeutic options, more or less demolition, and there is no standard options, and is decided for individual cases base on the type & mechanism of the lesions and to the experience and to the capacity of the surgical team. For such reasons, therefore, the (nom) of blunt abdominal trauma is not possible, to our judgment, to be carried out by all and in all hospital levels, since it requires multispecialty competences and needs of an organizing team with the ability to guarantee the availability 24 hours operating theatre, besides the presence of an intensive care unit.

In the United States of America, where the sanitary model of the management of traumas is considered the more the latest state of the art, they exist in hospital structures denominate "trauma hospital", deputies to the management of the politraumatized patients; these hospitals are separate among them in various levels (from V to I) based on their capacity, in terms of instrumental, organizational and human resources, to manage traumas of complexity and respectively increasing gravity (from V toward I) and are organized in a net of coordination that the every politraumatized patient examined and evaluated and admitted in the proper possible hospital level to the gravity and the more possible neighbour to the place of the trauma. Interesting, from this point of view, is the analysis that McIntyre and Coll<sup>57</sup> have made on the 2343 poltrumatized patients with splenic injuries admitted from the

1995 to the 2001 with all "Trauma hospital" of the Washington state; authors have brought, in the analysis of factors that meaningfully is they have in league with the failure of the (nom) (logistic regression), also the admission in a "Trauma hospital" of level III or IV in comparison with the admission in a hospital of level I and II.

For such reason it is desirable, also in Italy, the institution of centers of reference on the model of the American trauma centers, toward which it will be good standard start, by protected

transfer and rapid communication with other hospital level, the politrumatized patient, and in particularly those with blunt abdominal trauma that do not require a surgical immediate intervention.

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