

The prognostic factors of adult patients with hepatic portal venous gas in the ED

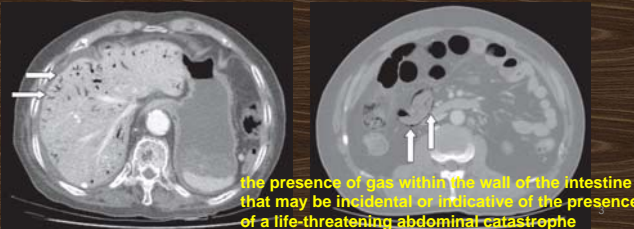
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Introduction

- HPVG can occur on conventional radiography, ultrasonography, color Doppler flow imaging and CT scans
- **High mortality rate**, 29%-90%
- **Bowel ischemia**: emergency exploratory laparotomy
- **Nonischemic conditions**: **digestive tract dilatation, intra-abdominal abscess, pancreatitis, cholangitis, gastric ulcer, enteritis, inflammatory bowel disease and diverticulitis**

Material and methods

| Subjects | CT and analysis | Etiology |
|---|---|--|
| <ul style="list-style-type: none"> • Retrospective, 2009.12 - 2013.12 • Older than 18 years old • Portal venous gas, hepatic gas (air), portal gas (air), splenic vein gas, portomesenteric gas, intrahepatic gas, mesenteric gas, bowel wall gas, and pneumatosis intestinalis (PI) | <ul style="list-style-type: none"> • Contrast CT scan • HPVG and PI | <ul style="list-style-type: none"> • Surgery: intra-op findings and histopathology reports • No surgery: symptoms, images, and courses |



| Characteristic | Total, n = 50 | Death, n = 28 56% | Survival, n = 22 | P | |
|------------------------------|---------------|----------------------|------------------|--------------|-------|
| Age (yr) | 38 - 105 | 39.18 ± 16.83 | 73.17 ± 14.42 | 64.09 ± 8.59 | .057 |
| Sex | | | | | .310 |
| Male | 23 (46%) | 10 (35.71%) | 11 (50%) | | |
| Female | 27 (54%) | 18 (64.29%) | 11 (50%) | | |
| Major predisposing disorders | | | | | |
| Diabetes mellitus | | | | | .384 |
| No | 35 (70%) | 21 (75%) | 14 (63.64%) | | |
| Yes | 15 (30%) | 7 (25%) | 8 (36.36%) | | |
| Hypertension | | | | | .750 |
| No | 26 (52%) | 14 (50%) | 12 (54.55%) | | |
| Yes | 24 (48%) | 14 (50%) | 10 (45.45%) | | |
| Chronic renal failure | | | | | .755 |
| No | 33 (66%) | 19 (67.6%) | 14 (63.64%) | | |
| Yes | 17 (34%) | 9 (32.14%) | 8 (36.36%) | | |
| Liver cirrhosis | | | | | .375 |
| No | 43 (86%) | 23 (82.14%) | 20 (90.91%) | | |
| Yes | 7 (14%) | 5 (17.86%) | 2 (9.09%) | | |
| Metastatic cancer | | | | | 1.000 |
| No | 46 (92%) | 26 (92.86%) | 20 (90.91%) | | |
| Yes | 4 (8%) | 2 (7.14%) | 2 (9.09%) | | |
| Clinical symptoms | | | | | |
| Fever | | | | | .323 |
| No | 30 (60%) | 19 (67.86%) | 11 (50%) | | |
| Yes | 20 (40%) | 9 (32.14%) | 11 (50%) | | |
| Chills | | | | | .776 |
| No | 45 (90%) | 26 (92.86%) | 19 (86.36%) | | |
| Yes | 5 (10%) | 2 (7.14%) | 3 (13.64%) | | |
| Abdominal distention | | | | | .522 |
| No | 18 (36%) | 9 (32.14%) | 9 (40.91%) | | |
| Yes | 32 (64%) | 19 (67.86%) | 13 (59.09%) | | |
| Diarrhea | | | | | .631 |
| No | 38 (76%) | 22 (78.57%) | 16 (72.73%) | | |
| Yes | 12 (24%) | 6 (21.43%) | 6 (27.27%) | | |

Results

| Characteristic | Total, n = 50 | Death, n = 28 | Survival, n = 22 | P |
|-----------------------|------------------|-------------------|------------------|------|
| AST (U/L) | 317.65 ± 1077.72 | 533.92 ± 1437.93 | 60.19 ± 63.87 | .113 |
| ALT (U/L) | 96.69 ± 219.09 | 131.77 ± 283.24 | 49.2 ± 48.04 | .148 |
| Lipase (U/L) | 662.13 ± 2506.49 | 1139.96 ± 3346.49 | 88.75 ± 163.26 | .138 |
| Amylase (U/L) | 213.04 ± 306.19 | 254.62 ± 358.90 | 156 ± 220.07 | .275 |
| ALP (U/L) | 95.7 ± 68.37 | 87.81 ± 47.89 | 106.35 ± 89.27 | .407 |
| BUN (mg/dL) | 45.82 ± 32.73 | 52.03 ± 33.01 | 37.12 ± 31.08 | .121 |
| Creatinine (mg/dL) | 3.16 ± 3.06 | 3.54 ± 3.24 | 2.68 ± 2.82 | .326 |
| Serum glucose (mg/dL) | 199.9 ± 129.66 | 195.71 ± 122.85 | 205.22 ± 140.60 | .800 |
| Metabolic acidosis | | | | .014 |
| No | 32 (66.67%) | 14 (51.85%) | 18 (85.71%) | |
| Yes | 16 (33.33%) | 13 (48.15%) | 3 (14.29%) | |
| Shock | | | | .031 |
| No | 19 (38%) | 7 (25%) | 12 (54.55%) | |
| Yes | 31 (62%) | 21 (75%) | 10 (45.45%) | |

The mortality of the patients with both shock and PI was very high (84%)

| | Shock | PI |
|--------|------------|------------|
| OR | 17.02 | 5.14 |
| 95% CI | 3.36-86.22 | 1.03-25.67 |

- Predict patient **mortality** after adjusting for age and sex
- No deaths were observed among the patients with neither shock nor PI
- Using the patients with PI but without shock as the reference group, the shock patients with and without PI were at **7.63- and 3.72-fold greater risks of death**, respectively

HPVG – possible mechanism

- **Mechanical theory of GI mucosal disruption**
 - Intraluminal gas is allowed to enter the portal system via portal microvenules
- **Infective theory**
 - Septic emboli or abscesses rupture via small portal venules
- **Bacteriological theory**
 - Gas collects within intestinal wall due to the sepsis caused by bacteremia

- Age, history, abdominal physical examination, or laboratory data alone were not predictive of prognosis
- The presence of PI was associated with poor prognosis
- When intraluminal gas enters the mesenteric veins, HPVG is associated with PI
- The presence of HPVG and PI → transmural bowel ischemia, higher mortality rate
- True bowel ischemia disease: PI, a small venous artery ratio, SMA thromboembolism and diminished wall enhancement

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- Shock: associated with poorer prognoses
 - Imply the severity of the underlying disease
 - Irreversible organ damage had occurred
 - Higher mortality despite receiving aggressive resuscitation and bowel resection
- Act quickly before the occurrence of shock rather than merely observing the patient
- The simultaneous presence of shock and PI has the highest specificity in predicting the mortality of ED HPVG patients

| Mortality rate | HPVG patients |
|----------------|---------------|
| Only shock | 70% (5/12) |
| Only PI | 42% (7/10) |
| Both | 84% (16/19) |
| None | 0% (0/9) |

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- Limitations
 - Retrospective analysis: require confirmation through a prospective study
 - Number of cases: relatively low
 - Database: from a single medical center

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Conclusions

- Hepatic portal venous gas reflects a diversity of underlying disease processes.
- The combination of clinical symptoms, physical examinations, and laboratory examinations alone is not a reliable indicator for prompt surgery.
- Early resuscitation should be initiated before shock occurs to enhance the chance of survival.
- The prompt consultation of surgeons for emergency operation is indicated for adult patients with HPVG who exhibit both shock and PI in the ED, as these signs may indicate true ischemic bowel disease.

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Thank you for your listening

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