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Relationship of the serum procalcitonin level with the severity of acute pancreatitis

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Abstract : The procalcitonin (PCT) level in the blood was determined in cases of acute pancreatitis. The PCT level was found to show a significant correlation with the severity of acute pancreatitis. Furthermore, the PCT level was significantly higher in the cases which developed MODS than in those which did not. The PCT level was significantly higher in the patients who eventually died than in those who survived. A significant correlation was observed between the serum PCT level and the serum tumor necrosis factor α level. Thus, PCT level was found to be a reliable indicator of the severity of acute pancreatitis.

Key words : pancreatitis, procalcitonin, tumor necrosis factor α, Ranson scoring system, multiple organ dysfunction syndrome

Introduction

Procalcitonin (PCT) is a precursor of the peptide hormone calcitonin, with a molecular weight of about 13 kD [1].

Determination of the serum PCT has been reported to be useful for both diagnosis and evaluation of severity of infections[2~4]. The usefulness of PCT determination has been reported for assessing the severity of the condition in cases of burns and those with complications after liver transplantation[5~7]. We have until now reported on numerous factors as markers of the severity of acute pancreatitis [8~11]. Recently, several reports of PCT measurement in cases of acute pancreatitis have been published [12~15]. In this study, we investigated the correlation between the serum PCT level and the severity of acute pancreatitis.

Subjects and Methods

This study was conducted with the informed consent of the patients or their family members and the approval of the Ethics Committee of Iwate Medical University.

The subjects were 25 patients with acute pancreatitis (20 males and 5 females; mean age ± S.D, 50.7 ± 13.8 years) who were under treatment at our center from the early stages of

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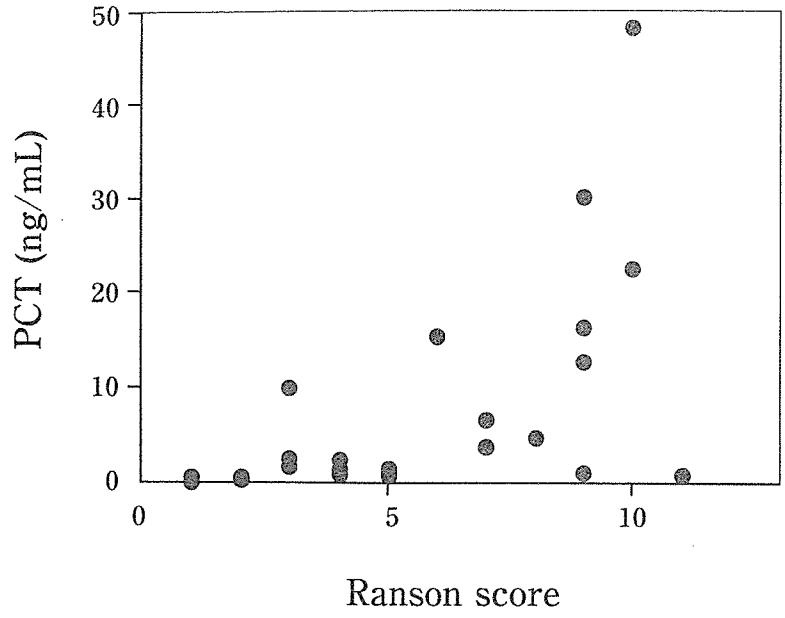

Fig. 1 A significant correlation was observed between the serum PCT level and the Ranson score (r = 0.5841, p = 0.0022).

their disease.

The severity of pancreatitis was graded according to the Ranson scoring system[16]. Multiple organ dysfunction syndrome (MODS) was diagnosed according to the diagnostic criteria of ACCP/SCCM[17].

Serum PCT was determined by chemoluminescence immunoassay (LUMI test PCT^R, BRAHMS Diagnostica GmbH, Berlin, Germany). The detection limit was 0.1 ng/mL.

Serum tumor necrosis factor α (TNF-α) was determined by enzyme-linked immunosorbent assay (ELISA) (Medgenix Diagnostics, Fleurus, Belgium). The detection limit was 3 pg/mL.

Mann-Whitney's U test was used to determine differences between the two groups. Pearson's equation was used to evaluate correlations. For both, the level of significance was defined as $p < 0.05$.

Results

A significant correlation was observed between the serum PCT level and the Ranson score at admission **(Fig. 1)**, between the serum TNF-α level and the Ranson score at admission (r = 0.5718, p = 0.0028), and between the serum PCT level and serum TNF-α level at admission (r = 0.6083, p = 0.0013) **(Fig. 2)**.

Twelve of the patients developed MODS, while the remaining 13 patients did not. The serum PCT level was 13.6±14.3 ng/mL in the patients who developed MODS, and 1.6±2.6 ng/mL in those who did not; the level in the former group was significantly higher **(Fig. 3)**.

The serum TNF-α level was 140.8±89.2 pg/mL in the patients who developed MODS, and 54.4±34.3 pg/mL in those who did not; the level in the former group was significantly higher (p = 0.001).

Eight patients died and 17 survived while under observation. The PCT level was 17.7±15.7 ng/mL in the patients who died, and 2.5±4.1 ng/mL in those who survived; the level was significantly higher in those who died than in those who survived **(Fig. 4)**. The serum TNF-α level was 151.2±99.7 pg/mL in the patients who died, and 69.8±51.6 pg/mL in those who survived; the level in those who died was significantly higher.

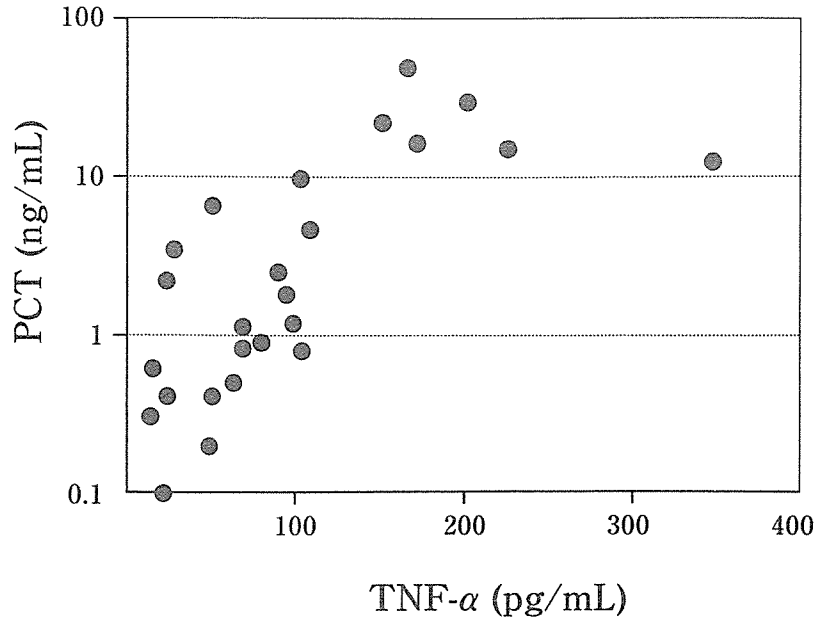

Fig. 2 A significant correlation was noted between the serum PCT level and the serum TNF-a level (r = 0.6083, p = 0.0013).

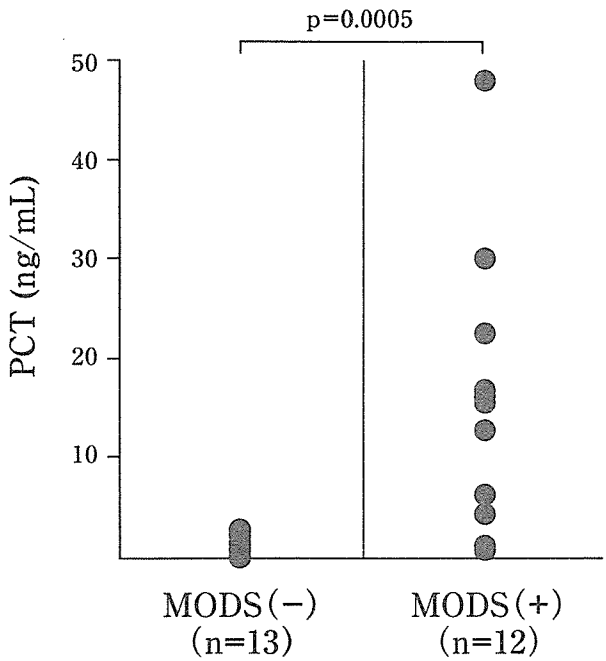

Fig. 3 The serum PCT level in the patients who developed MODS was significantly higher than that in those who did not develop MODS.

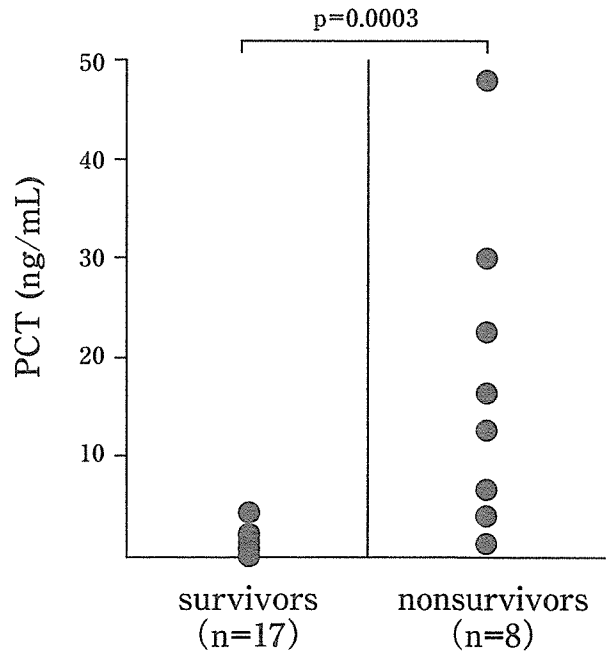

Fig. 4 The serum PCT level in the patients who died was significantly higher than that in those who survived.

Discussion

Increase in the PCT level in the blood up to 100 ng/mL or more has been reported in cases of severe infections complicated by sepsis. However, the cells producing PCT have yet to be identified. Elevation of the serum PCT triggered by infection has been reported even in cases who have undergone total thyroid-

ecotmy [18].

In cases of injury, the serum PCT level has been reported to transiently increase in the early stage after injuries, depending on the severity[19]. Serum PCT levels have been reported to be increased in cases of cardiogenic shock [20, 21]. Elevation of the PCT level has also been reported in patients with burns in the respiratory tract [5].

In cases of acute pancreatitis, it has been reported that the possibility of infectious necrosis must be borne in mind when elevation of the serum PCT levels to 1.8 ng/mL or more persists for more than 2 days[14, 22]. In our present study, the PCT level determined immediately after the diagnosis of the disease reflected the severity of the disease well. The serum PCT level determined immediately after the onset of acute pancreatitis was significantly higher in the patients who developed MODS and in those who eventually died. These findings suggest that the serum PCT level determined immediately after the onset of acute pancreatitis is a very reliable predictor of the prognosis in these patients.

When endotoxin was administered to healthy subjects, symptoms of SIRS, such as chills, rigidity, myalgia and fever appeared. The TNF-α production peaked within 1 or 2 hours, and decreased to the baseline level within about 6 hours. The IL-6 level peaked within 3 hours, and decreased to the baseline level within about 8 hours. On the other hand, the PCT level began to increase at around 4 hours after the endotoxin administration, reached a plateau within about 6 hours, and remained at this level for about 24 hours [20]. In our present study, the endotoxin level in the blood was almost consistently within the normal range, suggesting that the elevated PCT production was not likely to be the result of endotoxin stimulation. However, since a significant correlation was observed between the serum TNF-α level and the serum PCT level, it is possible that TNF-α induced the PCT production.

In the future, the association between the changes in the condition of the patient and the PCT level need to be examined on the basis of continuous determination of the PCT level.

Acknowlegement

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Procalcitonin level as a reliable indicator of the severity of abdominal sepsis

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Abstract : We determined the serum levels of procalcitonin (PCT), a precursor of calcitonin, in patients with abdominal sepsis as a marker for an infectious diagnosis.

Methods : The subjects consisted of 11 patients with sepsis, 14 patients with severe sepsis, and 10 patients with septic shock. The PCT level in the sepsis group (4.3 ± 2.3 ng/mL) was significantly lower than that in the severe sepsis group (9.7 ± 2.7 ng/mL), and the level in the septic shock group (36.5 ± 28.4 ng/mL) was significantly higher than that in the severe sepsis group. A significant correlation was thus observed between the PCT level and the sepsis-related organ failure assessment score (SOFA score). These findings suggest that the serum level of PCT may faithfully reflect the severity of abdominal sepsis.

Key words : procalcitonin, abdominal sepsis, severity, IL-6, CRP

Ⅰ. Introduction

We reported previously that numerous mediators are produced in cases of infection, especially in conditions complicated by sepsis[1]. Among these, inflammatory cytokines are known to play particularly important role.

Procalcitonin (PCT) is a precursor of the peptide hormone, calcitonin, and its molecular weight is about 13 kD.[2] Recently, measurements of the PCTlevels in the serum have been reported to be useful for the diagnosis of infection or sepsis[3~10].

In this study, we determined the levels of inflammatory cytokines and PCT in cases of abdominal sepsis, and examined their association with the severity of the condition.

Ⅱ. Materials and Methods

Thirty-five patients with abdominal sepsis were studied. The diagnosis and the severity of the condition in the study cases are presented in Table 1.

The mean age of the patients was 68.4 ± 11.2 years. They consisted of 23 males (69.0 ± 11.2 years) and 12 females (67.1 ± 11.7 years). There was no significant difference in the mean age

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Table 1 Diagnosis in patients who developed Sepsis, severe sepsis, and septic shock

	Sepsis	Severe sepsis	Septic shock	Total
Pancreatitis	2	3		5
Biliary peritonitis	2	2	1	5
Colon perforation	3	4	4	11
Mesenteric infarction	1	2	2	5
Traumatic peritonitis	1	1	1	3
Postoperative peritonitis	2	2	2	6
Total	11	14	10	35

between the male and female patients.

The criteria of Bone et al. were used for the classification into sepsis, severe sepsis and septic shock[11].

Eleven patients were categorized into the sepsis group (65.6 ± 13.9 years), 14 into the severe sepsis group (70.4 ± 11.0 years), and 10 into the septic shock group (68.8 ± 8.4 years). There was no significant difference in the mean age among the three groups.

To determine the levels of PCT, tumor necrosis factor α, (TNF-α) and interleukin 6 (IL-6), the serum was separated immediately after the collection of the blood samples, and preserved at −80℃. The serum CRP level was then determined immediately after the collection of blood samples.

The serum PCT level was determined by a chemoluminescence immunoassay (LUMI test PCT™, BRAHMS Diagnostica GmbH, Berlin, Germany). The detection limit was 0.1 ng/mL.

The serum TNF-α level was determined by an enzyme-linked immunosorbent assay (ELISA) (Medgenix Diagnostics, Fleurus, Belgium). The detection limit was 3 pg/mL.

The serum IL-6 level was also determined by ELISA (TFB Co. Ltd., Tokyo, Japan), and the detection limit was 10 pg/mL.

The serum CRP level was determined immediately after isolation of the serum by Latex Enhanced Turbidimetric Reagents (Immunoticles Auto CRP, A&T Corporation, Kanagawa, Japan). Normal range, less than 0.3 mg/dL.

The SOFA score was used as an indicator of the severity of sepsis[12].

Mann-Whitney's U test was used to examine the differences between two groups. Pearson's equation was used to test the correlations. For both, the level of significance was defined as $p < 0.05$.

Ⅲ. Results

1. PCT levels

The serum PCT level was 4.6 ± 2.3 ng/mL in the sepsis group and 9.7 ± 2.7 ng/mL in the severe sepsis group, and thus it was significantly higher in the former group. The PCT level in the septic shock group was 36.5 ±28.4 ng/mL, which was significantly higher than that in the severe sepsis group **(Fig. 1)**.

2. IL-6 levels

The serum IL-6 level in the sepsis group was 32.0 ± 14.9 pg/mL and that in the severe sepsis group was 108.2 ± 54.9 pg/mL, with the former being significantly higher than the latter. The IL-6 level in the septic shock group was 254.5 ± 304.2 pg/mL, which was significantly higher than that in the sepsis group, but not significantly different from that in the severe sepsis group **(Fig. 2)**.

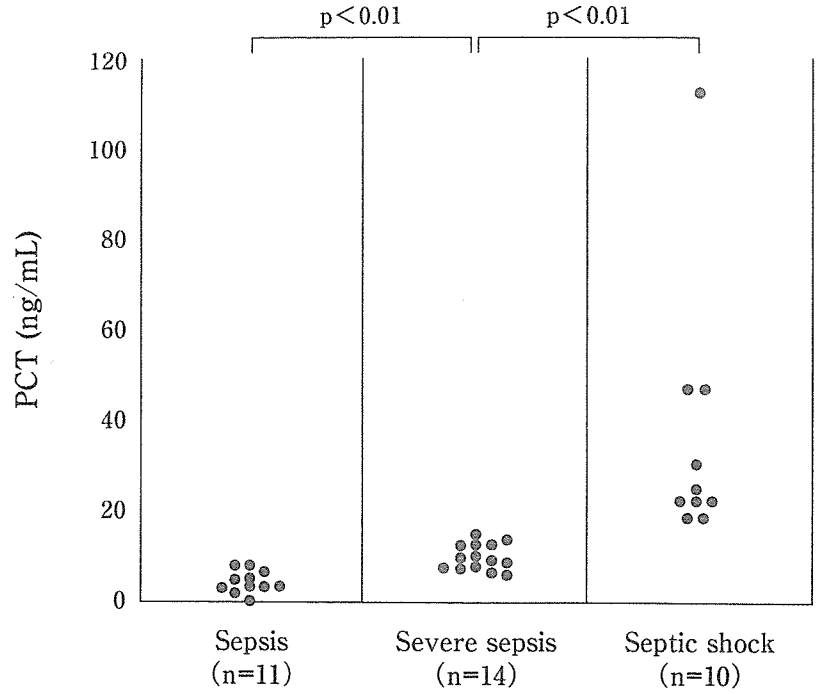

Fig. 1 PCT levels in patients with abdominal sepsis.

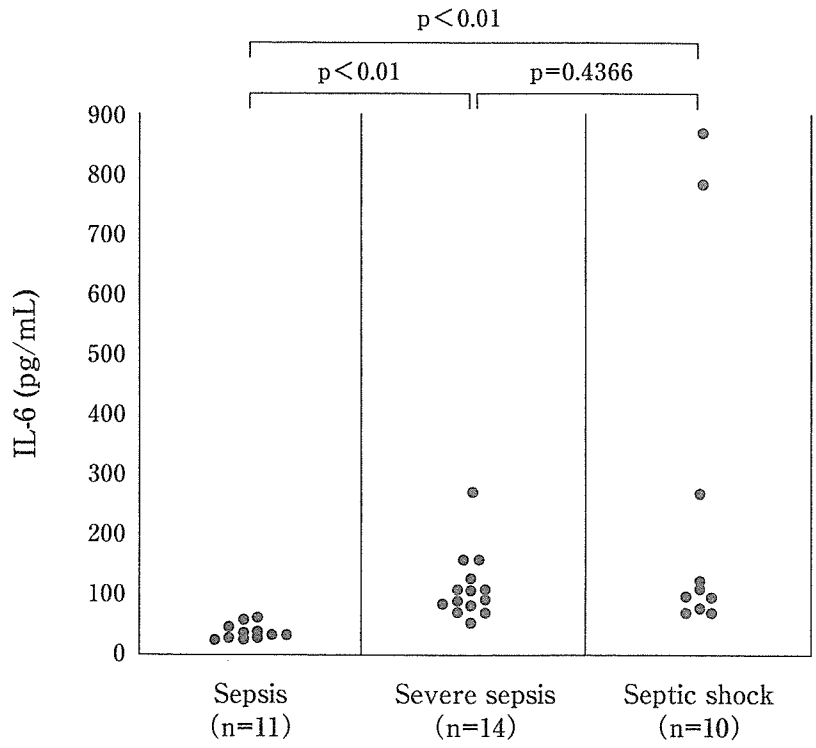

Fig. 2 IL-6 levels in patients with abdominal sepsis.

3. TNF-α levels

The serum TNF-α level was 36.0 ± 26.0 pg/mL in the sepsis group and 81.4 ± 28.5 pg/mL in the severe sepsis group, with the level in the former group being significantly higher than that in the latter group. The TNF-α level in the septic shock group was 146.6 ± 96.1 pg/mL, which was significantly higher than that in the

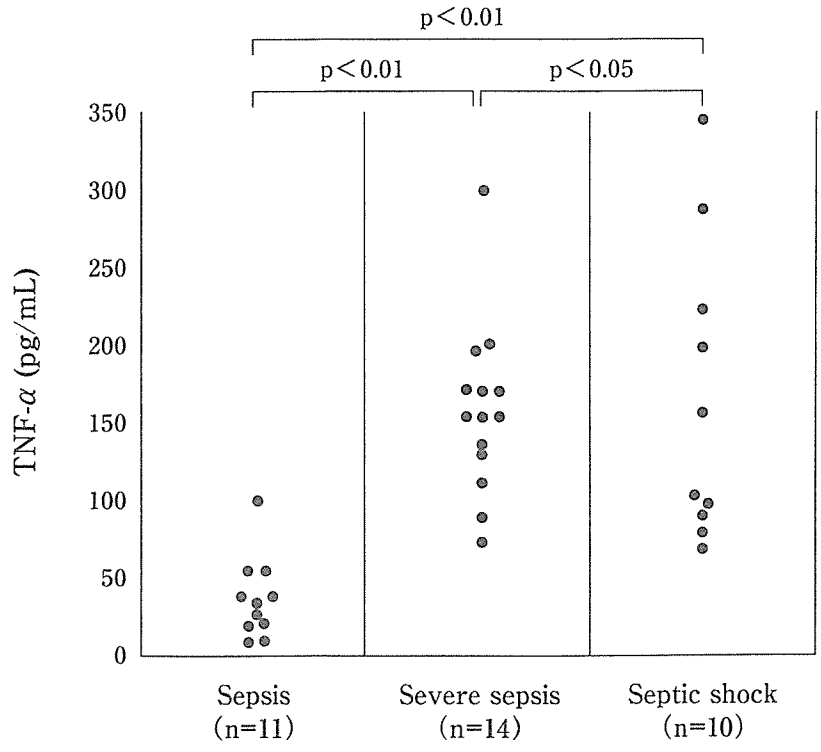

Fig. 3 TNF-α levels in patients with abdominal sepsis.

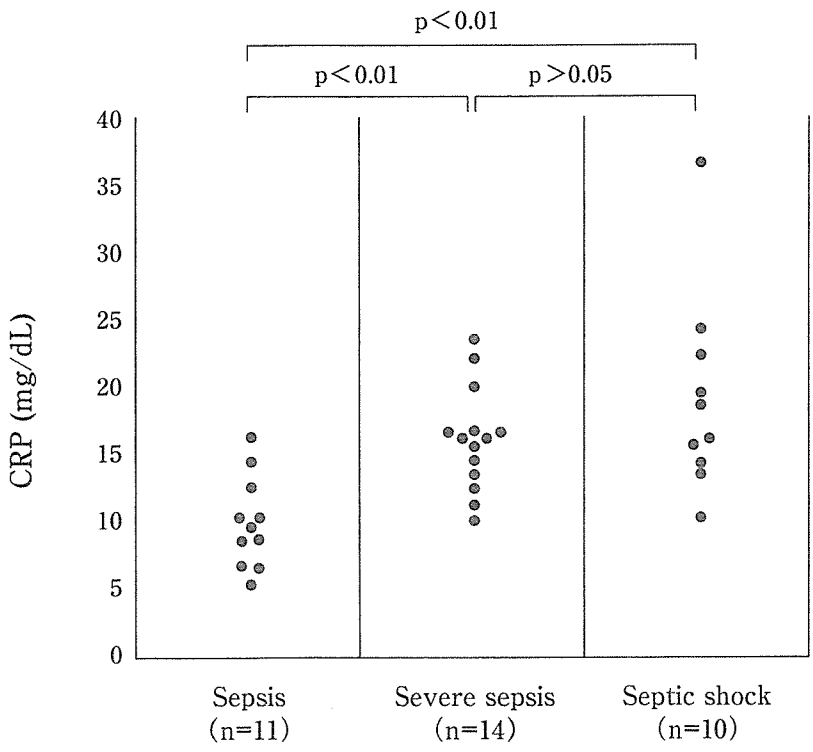

Fig. 4 CRP levels in patients with abdominal sepsis.

severe sepsis group (Fig. 3).

4. CRP levels

The serum CRP level was 10.0 ± 3.4 mg/dL in the sepsis group and 16.1 ± 3.9 mg/dL in the

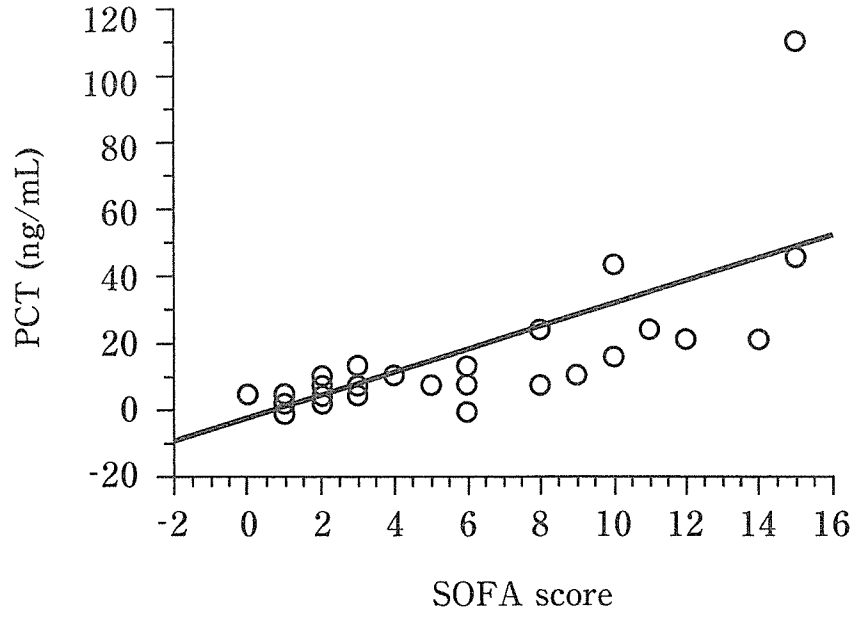

Fig. 5 The correlation between SOFA score and PCT levels.

Table 2 Mean values for patients who suvived and nonsurvived

	Survivors (n=28)	Nonsurvivors (n=7)	*P* value
PCT (ng/mL)	11.6±11.7	31.6±36.0	0.0167
TNF-α (pg/mL)	77.1±61.7	146.1±99.8	0.0373
IL-6 (pg/mL)	104.3±157.6	213.1±259.3	0.0832
CRP (mg/mL)	141.1±5.0	18.9±8.9	0.2232
SOFA score	3.8±3.5	11.3±2.6	0.0003

severe sepsis group, and thus it was significantly higher in the former group. The serum CRP level in the septic shock group was 19.3 ± 7.4 mg/dL, which was significantly higher than that in the sepsis group, but not significantly different from that in the severe sepsis group **(Fig. 4)**.

5. SOFA scores and PCT levels

A significant correlation was observed between the SOFA scores and the serum PCT levels **(Fig. 5)**.

The SOFA score exhibited significant correlations with the serum IL-6, TNF-α and CRP levels ($r = 0.3487$, $p = 0.0401$; $r = 0.7009$, $p < 0.0001$; $r = 0.4011$, $p = 0.0169$).

6. Comparison of the various parameters in the patients who survived and those who died during the study period

When the patients who survived and patients who died during the study period were compared, the PCT level, TNF-α level and SOFA score were found to be significantly higher in the patients who died **(Table 2)**.

Ⅳ. Discussion

Numerous cells, including monocytes and macrophages, produce cytokines, but the cells producing PCT have not been identified yet. An elevation of the serum PCT level triggered by infection has been reported in patients even after a total thyroidectomy[9].

When endotoxin is administered to healthy subjects, the symptoms of SIRS, such as chills, rigidity, myalgia and fever appear. The TNF-α production peaks about 1 or 2 hours after the endotoxin administration, and decreases to the baseline level within about 6 hours. The IL-6 level peaks within 3 hours of endotoxin administration and decreases to the baseline level within about 8 hours. On the other hand, PCT becomes detectable in the serum about 4 hours after endotoxin administration, thereafter it begins to plateau at about 6 hours after the administration, and then remains at this level for about 24 hours[10].

Our present study revealed that both the PCT and TNF-α levels, in particular, the former, faithfully reflect the severity of abdominal sepsis. However, the serum IL-6 and CRP levels did not reliably reflect the severity of abdominal sepsis.

An elevation of the serum PCT level has also been reported in malaria[4], and melioidosis[6], with the latter caused by a Gram-negative bacillus. In both conditions, a greater elevation has been reported in more severe cases.

Our present study was confined to patients with abdominal sepsis. However, determination of the serum level of PCT appeared to be more useful than that of the serum levels of CRP, TNF-α and IL-6 for accurately diagnosing a bacterial infection, in general, and for assessing its severity, although it was not necessarily a specific method for the diagnosis.

We herein described the usefulness of determining the serum levels of PCT to estimate the severity of abdominal sepsis. In the future, the serum levels of PCT need to be examined in a larger subject population with sepsis caused by different types of bacteria, in order to determine the sensitivity and specificity of determining the PCT levels on order t make an accurate diagnosis of sepsis.

Acknowledgement

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プロカルチトニン値は敗血症時の組織酸素代謝と皮下血流量を反映する

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要 旨：敗血症時の血中のプロカルチトニン値と末梢循環の指標として皮下血液量を，組織酸素代謝の指標の指標として胃粘膜pH（pHi）を測定した。プロカルチトニン値と皮下血流量，pHi値間には有意の負の相関関係がみられ，プロカルチトニン値が末梢循環および組織酸素代謝を良く反映していることがわかった。また，プロカルチトニンとSOFAスコア間には有意の相関関係がみられ，プロカルチトニン値は病態の重症度も良く反映していることが判った。

Key words：プロカルチトニン，敗血症，胃粘膜pH，皮下血流量，SOFAスコア

はじめに

プロカルチトニン（procalcitonin: PCT）はペプチドホルモンであるカルチトニン（calcitonin）の前駆体で，その分子量は約13kDである[1]。最近，PCTが感染症あるいは敗血症の診断に有用であるとの報告が欧米においてみられる[2~9]。我々も敗血症診断法としてPCTを測定する事の有用性について報告してきた[10~12]。また，PCT値は敗血症における重症度も良く反映する[11~13]。

我々は，敗血症時の末梢循環の指標として皮下血液量を，組織酸素代謝の指標の指標として胃粘膜pHを測定し，両者間に有意の相関関係がみられることを報告した[14]。

今回，敗血症においてプロカルチトニン値と皮下血液量および胃粘膜pHとの関連について検討した。

対象および方法

対象は汎発性腹膜炎に敗血症を合併した3例である。敗血症の診断はACCP/SCCM Consensus Conferenceによった[15]。

重症度の指標としては，sepsis-related organ failure assessment（SOFA）スコア[16]を用いた。

PCTの定量は化学発光免疫測定法（LUMI test PCT™, B・R・A・H・M・S DIAGNOSTICA GmbH, Berlin, Germany, Lumico Analyzer SA-300, マイクロテック，ニチオン，東京）により測定した。その測定限界値は0.1ng／mLであり，敗血症は2ng／mL以上としている[17]。

胃粘膜pH（pHi）はgastrointestinal tonometer and sump tube; TGS, トノメトリック社，USA）を用いて測定した。

皮下血液量は，レーザードップラー法で測定した（Advance laser flow meter; Alfa 2100, アド

Masahiro Kojika et al.: Procalcitonin level reflects the tissue oxygen metabolism and dermal blood flow in sepsis.
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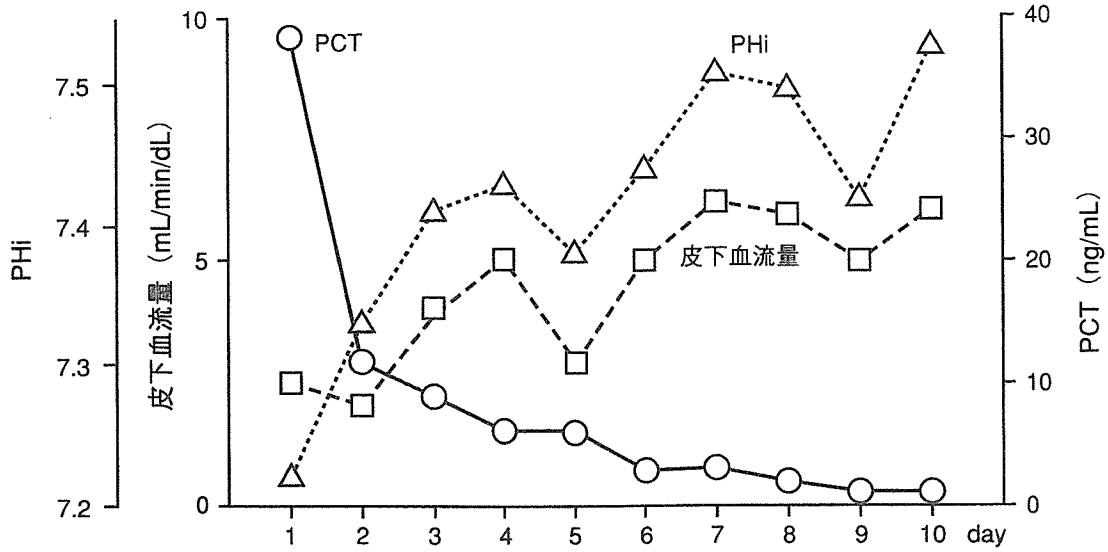

図1　60歳代の男性。直腸穿孔による汎発性腹膜炎に敗血症を合併した。手術後症状は軽快した。

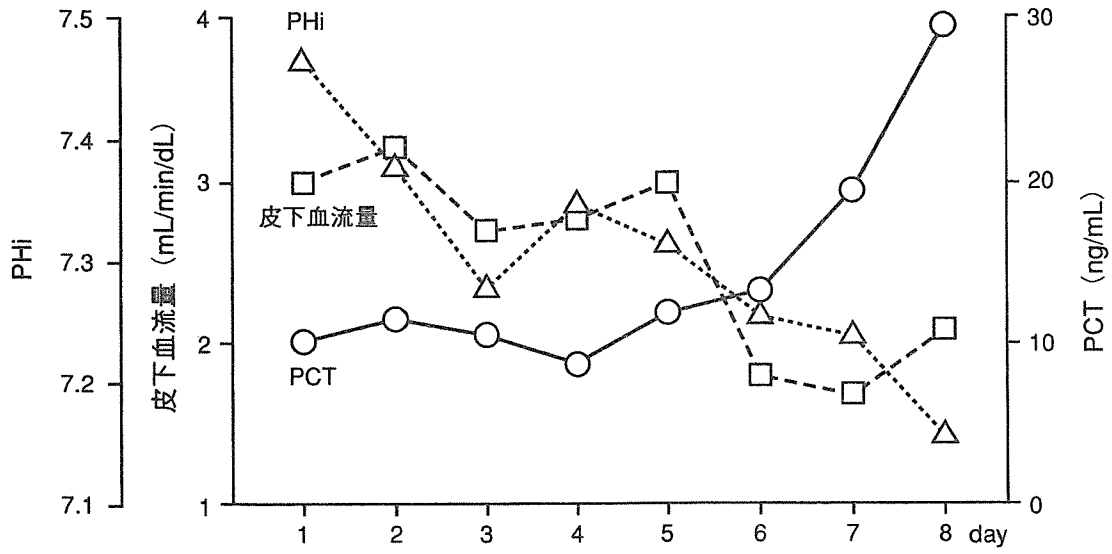

図2　60歳代の女性。後腹膜膿瘍後の敗血症性多臓器不全症候群で死亡した。

バンス社，東京)。測定は肘関節から3分の1の前腕背側にプローベを装着・固定し行った。

相関関係はPearsonの式を用いて行い，$p<0.05$で有意差ありとした。

結　果

症例1：70代の男性。直腸穿孔による腹膜炎に敗血症性ショック，汎発性血管内凝固症候群，急性呼吸促迫症候群を合併していた。術後のpHi値は7.39以下で推移していたが，症状の軽快に伴い上昇した。皮下血流量は2.6mL／min／dLから上昇を示した。一方，PCT値は敗血症性ショック時に38.6ng／mLと上昇したが，症状の改善に伴い著明に低下した（図1）。

症例2：60歳代の女性。後腹膜膿瘍による敗血症性ショックで紹介入院となった。手術施行するも5病日には敗血症性多臓器不全症候群を併発し，8病日目に死亡した。PHi値の低下とともに皮下血流量も入院時3.0mL／min／dLから2.0mL／min／dL前後に低下した。PCT値は入院時10.3ng／mLで，死亡時は29.8ng／mLまで上昇した（図2）。

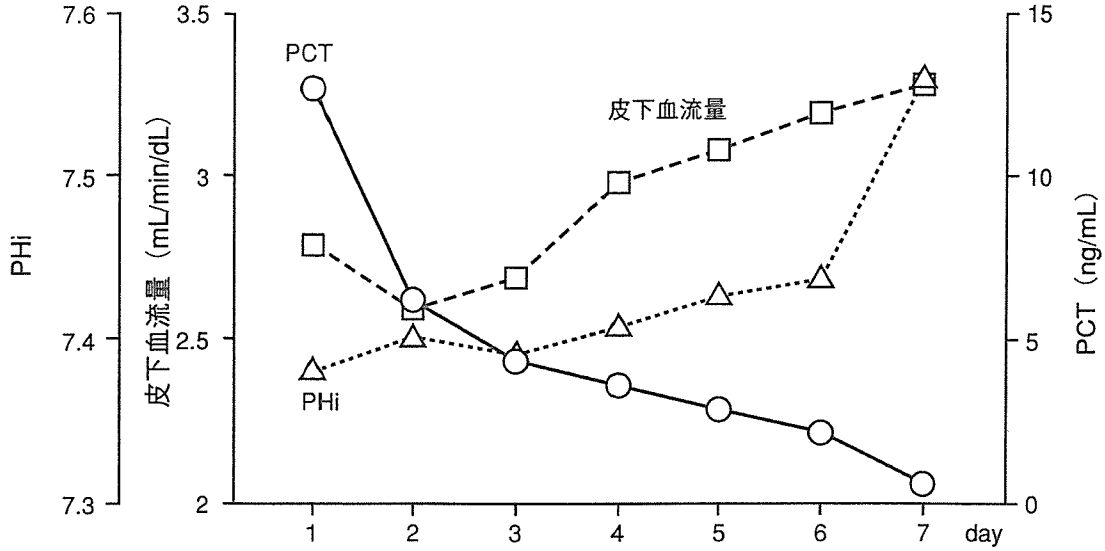

図3　70歳代の男性。S状結腸穿孔後の敗血症から離脱した。

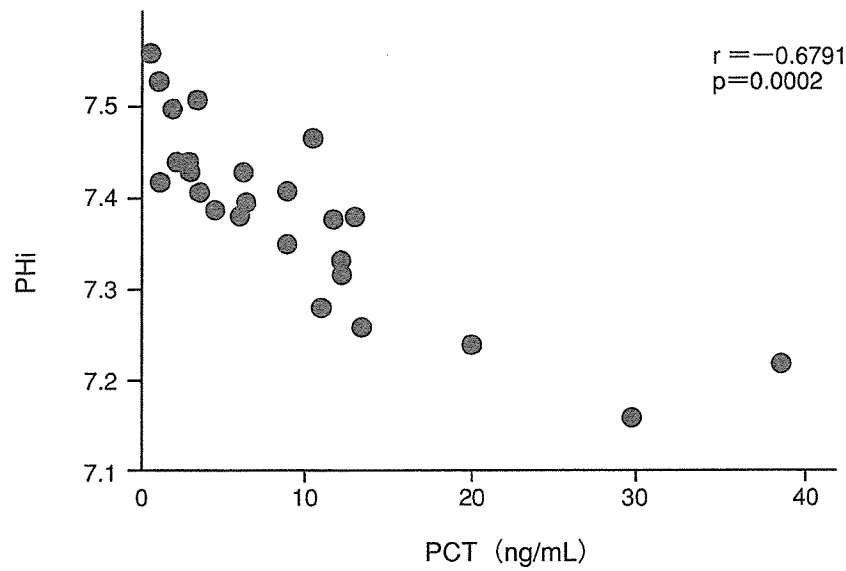

図4　PCT値と皮下血流量値間には有意な負の相関関係が認められる。

症例3：70歳代の男性。S状結腸穿孔後の敗血症性ショックの患者である。来院時のPCT値は12.8ng／mL，pHiは7.38，皮下血流量は2.8mL／min／dLであった。病態の改善に伴い，PCT値は低下し，一方pHiおよび皮下血流量は増加した（図3）。

3症例の全測定ポイントのPCT値とpHi値間には有意な負の相関関係がみられた（r＝−0.6791，p＝0.0002）（図4）。

3症例の全測定ポイントのPCT値と皮下血流量値間には有意な負の相関関係がみられた（r＝−0.5354，p＝0.0058）（図5）。

また，pHi値と皮下血流量値間にも有意の相関関係がみられた（r＝0.6183，p＝0.0010）。

PCT値とSOFAスコア間にも有意の相関関係がみられた（r＝0.8185，p<0.0001））

考　察

PCT値は敗血症の重症度を良く反映することは，これまで報告してきたが[11〜13]，今回の検討

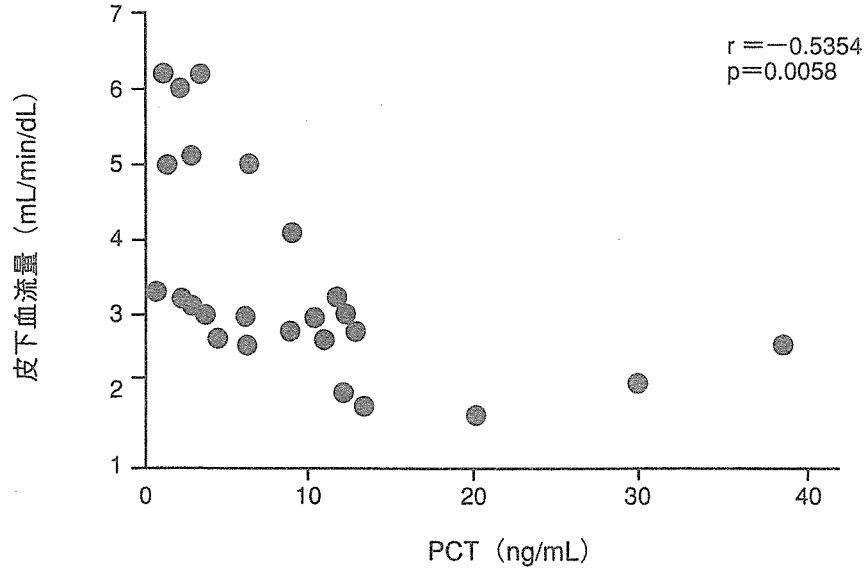

図5　pHi値と皮下血流量値には有意な負の相関関係が認められる。

でも同様な結果が得られてた。

pHiは病態の変化に応じて変動した。死亡例においては低値で推移し，生存例においては全身状態の改善に伴い，すなわちSOFAスコアの改善に伴いpHi値は上昇し7.4以上まで上昇することが認められた。pHiが組織酸素代謝不全の良い指標となるとの報告がある[18,19]。pHiが低値であるときは，組織における低酸素血症の状態であることが窺われる[20]。PCT値とpHi値間に有意の相関関係がみられることは，胃粘膜pHをPCT値が反映していることであり，PCT値が組織酸素代謝をも反映していることを意味している。

レーザードップラー法による皮下血流量も我々の以前の報告[14]と同様の結果が得られ，pHiと同様の推移を示した。また，PCT値とも有意の相関関係がみられた。このことはPCT値が敗血症において末梢循環，組織酸素代謝の指標の一つとなりうる可能性を示しているものと思われる。

一方で，PCTを投与するとショックを惹起して死亡率が増加し，抗PCT血清を投与することにより生存率が増すとの報告もある[21]。このことはPCTそのものが，循環動態の変動に関与している可能性が窺われる。また，interleukin 2（IL-2）を投与するとPCTが産生されるとの報告もある[22]。我々は，ヒトの敗血症性ショック時にtumor necrosis factor α，IL-2が上昇し，ショック発現に関与している可能性について報告しているが，敗血症性ショック時にはPCTも上昇することからも，PCTがショック発現に直接係わる生理作用を有している可能性も窺われる。

しかし，測定値が乖離した値を示す場合があることが認められたが，その原因の一つとしてTGSの位置不良や皮膚温や発汗などによるプローベへの外的因子の関与が考えられた[24]。

謝　辞

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敗血症に対する抗TNFモノクローナル抗体投与時のプロカルチトニン値の推移：症例報告

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八重樫泰法*

要　旨：症例は70歳代の男性である。敗血症性ショックにTNF-αのモノクローナル抗体を投与した。血中のTNF-α，IL-6およびNOx値が低下した。感染症の診断マーカーとして有望なプロカルチトニン値は，敗血症性ショック時に上昇し，症状の改善に伴い低下が認められ，重症度と良い相関関係が認められた。

Key words : 抗TNF抗体，プロカルチトニン，敗血症，サイトカイン，一酸化窒素

Ⅰ．はじめに

バイオテクノロジーが進歩した過去30年間に，敗血症の病態生理に関係するいくつかの特異的炎症性メディエータが報告された。Tumor necrosis factor（TNF）は敗血症発症との関連性が明らかとなった最初のサイトカインである。BeutlerとCeramiは慢性感染症患者に認められる重度の体重減少（悪液質）の原因を探るうちにこの関連性を見出した[1]。彼らは単球由来因子が原因であると判断した。引き続きこのタンパク質をクローン化し，配列決定を行い，同一の腫瘍壊死因子であることを突き止めた。敗血症の発症におけるカケクチン/TNFの作用を検討するため，*Beutler*らはlipopolysaccharide（LPS）の作用に抵抗する系統のマウスが，LPSに応答してTNFを合成しないことを示した[2]。さらにLPS-抵抗性マウスにTNFを静注すると，正常マウスへのLPS静注と同様に，敗血症の病態生理が再現されることを示した。TNF-αのモノクローナル抗体（TNFMAb）については9件の臨床試験が公表されている[3~11]。本邦においても，1991年からヒトに対するTNF-Mabの治験が行われた。今回は，そのうちで敗血症の診断あるいは重症度の判定に有用であるといわれるプロカルチトニン（procalcitonin: PCT）[12~14]を測定した症例を経験したので報告する。

Ⅱ．方　法

本試験は，家族の同意を得るとともに岩手医科大学倫理委員会の承認を得て行った。

今回投与したTNFαMAbはBAYx1351（Bayer Corporation, Berkeley, CA）である。本剤は，recombinantヒトTNFで免疫されたマウス脾臓細胞とマウス骨髄腫細胞とを融合して得られるハイブリドーマA10G10の培養上清液から精製され，TNFによる細胞毒性を完全に中和する。

Shigeatsu Endo et al.: Procalcitonin levels in a septic patient by infusion of monoclonal antibodies to human tumor necrosis factor α: A case report.

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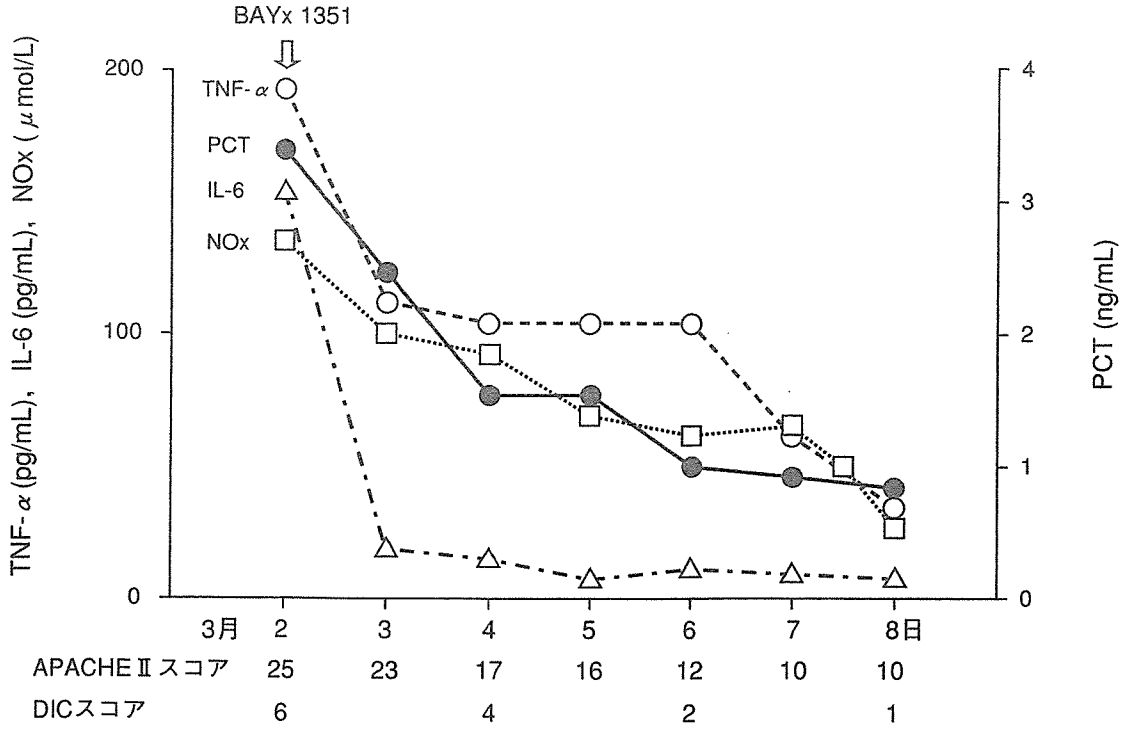

図1　BAYx 1351投与後のPCT，TNF-α，IL-6，NOx値の推移

本症例においては，BAYx1351は3mg/kgを30分間で1回だけ投与した。

PCTは化学発光免疫測定法（LUMI test PCT™，B・R・A・H・M・S DIAGNOSTICA GMBH，Berlin，Germany）により測定した。2 ng/mL以上を敗血症としている。

各種サイトカインはいずれもenzyme-linked immunosorbent assay（ELISA）で測定した。TNF-αはMedogenix社製（Fleurus，Belgium），Interleukin 6（IL-6）はTFB社製（Tokyo，Japan）を用いた。

NOの最終代謝産物であるnitrite/nitrate（NOx）はGriess法により自動分析器（TCI-NOX 1000; Tokyo Kasei Kogyo Co.，Ltd.，Tokyo）で測定した[15]。

エンドトキシン値はエンドトキシン特異的な高感度法で測定した[16]。

敗血症の診断はsystemic inflammatory response syndrome（SIRS）を決めたACCP/SCCMの基準を用いた[17]。

重症度の指標としては，acute physiology and chronic health evaluation II（APACHE II）スコアを用いた[18]。

disseminated intravascular coagulation（DIC）の診断は急性期のDIC診断基準を用いた[19]。

Ⅲ．症　例

症　例：70歳代の男性

既往歴：前立腺腫瘍で13年前に手術施行している。

臨床経過：1992年3月2日3時にショック状態で紹介となった。来院時収縮期血圧84mmHg，心拍数120回/分，呼吸数28回/分，体温38.8度，白血球数4,300/mm^{3}とSIRSの3項目を満たす敗血症性ショック状態であった。血小板数は72,000/mm^3，PT比1.26，FDP 22.6mg/mLとDICスコアは6点であった。診断は尿路感染症からの敗血症性ショックであった。血中エンドトキシン値は28.6pg/mLと高値を示し，喀痰，尿からは*Pseudomonas aeruginosa*が検出された。5時よりBAYx1351 3mg/kgを30分かけて静注した。BAYx1351投与により，速やかに症状の改善をみた。PCT，TNF-α，IL-6，NOx値も速やかに低下した（図1）。APACHE IIスコアとPCT値間には有意の相関関係が認められた（図2）。