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Two Older Adult Patients With Anorexia and Cachexia Following Refractory *Mycobacterium avium-intracellulare* Complex Pulmonary Disease Given Acupuncture Treatment to Improve Appetite and Food Intake

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Conflict of interest: None declared

Case series

Patients: Male, 70-year-old • Female, 60-year-old

Final Diagnosis: *Mycobacterium avium-intracellulare* complex pulmonary disease

Symptoms: Anorexia • cachexia

Clinical Procedure: —

Specialty: Pulmonology • Traditional medicine

Objective: Unusual clinical course

Background: Refractory *Mycobacterium avium-intracellulare* complex pulmonary disease (MAC-PD) is often complicated by anorexia, weight loss, and cachexia. This report describes 2 older adult patients with anorexia and cachexia following refractory MAC-PD given acupuncture treatment to improve appetite and food intake.

Case Reports: Case 1 was a man in his 70s with cavitary nodular bronchiectatic MAC-PD diagnosed 7 years earlier based on the 2007 American Thoracic Society/Infectious Diseases Society of America (ATS/IDSA) criteria. His chest radiographic lesions had progressively worsened, with persistent smear positivity despite multidrug chemotherapy. He developed complete anorexia and eating-related dyspnea; his body weight decreased to 35.4 kg (body mass index [BMI] 11.8 kg/m^2). Case 2 was a woman in her 60s who was diagnosed with nodular bronchiectatic MAC-PD with cavities, which developed into a giant cavity, 4 years earlier. She developed severe anorexia and postprandial dyspnea, and her body weight was 31.0 kg (BMI 13.2 kg/m^2). Both patients received manual acupuncture at CV12, ST36, LU9, and individualized points 3 times weekly for 3 weeks. Appetite on a 100-mm visual analog scale, energy intake, body weight, and serum albumin improved in both patients. Sputum acid-fast bacillus (AFB) smear status and radiographic findings were unchanged. No adverse events occurred.

Conclusions: Nine acupuncture sessions over 3 weeks improved appetite, dietary intake, and nutritional indices in 2 cachectic patients with refractory MAC-PD without altering bacteriological or radiological disease activity. Acupuncture merits consideration as adjunctive care for anorexia in this setting. Controlled studies are needed.

Keywords: Acupuncture • Anorexia • Cachexia • *Mycobacterium avium-intracellulare* Infection • Case Reports

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/954027

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Introduction

Pulmonary disease caused by the *Mycobacterium avium-intracellulare* complex (MAC-PD) is the most common form of nontuberculous mycobacterial lung disease, and its incidence continues to rise worldwide, particularly among older women without pre-existing lung disease [1]. Diagnosis requires that clinical, radiologic, and microbiologic criteria all be met [2,3].

The first-line treatment of MAC-PD is a macrolide-based multidrug regimen combining clarithromycin or azithromycin with rifampicin and ethambutol; an injectable aminoglycoside such as amikacin or streptomycin is added for cavitary, advanced, or macrolide-resistant disease [2]. Despite prolonged treatment, sputum culture conversion is not achieved in a substantial proportion of patients, and the disease can progress to a refractory, treatment-experienced state associated with declining lung function [1,3,4].

Not every patient with MAC-PD is cleared of the organism by chemotherapy. In a cohort followed for a decade at our hospital, patients who remained smear-positive for acid-fast bacilli (AFB) through successive regimens while their radiographic lesions extended had markedly worse survival than any other treatment-outcome group [4-6]. Body mass index (BMI) has repeatedly been identified as an independent predictor of death in MAC-PD [4,6], and a low BMI at the start of treatment also predicts failure of sputum conversion [7].

Cachexia, defined as severe involuntary weight loss, muscle wasting, and fatigue, is a common constitutional feature of progressive MAC-PD and is among the strongest prognostic indicators in this disease, independent of microbiological status [3,4]. However, no pharmacological therapy has been established to reverse anorexia or cachexia in patients with MAC-PD, and supportive treatment remains limited to dietary advice and oral supplements.

Elsewhere in medicine, acupuncture has been tested as a way of supporting appetite and nutrition in wasting illness. Patients with chronic obstructive pulmonary disease (COPD) who received real rather than placebo needling in a randomized trial were afterward less breathless and could walk further [8]; when the nutritional data from that same trial were re-examined on their own, body weight and related indices were also found to have improved [9]. In advanced cancer, needling of points on the ear raised appetite scores and lessened nausea in a small, randomized study [10], and in an animal model of anorexia produced by chemotherapy, electroacupuncture shifted the circulating signals that regulate appetite [11]. To our knowledge, acupuncture for anorexia and cachexia has not previously been reported in patients with refractory MAC-PD. This report describes 2 older adult patients with anorexia and cachexia following refractory MAC-PD who were given acupuncture treatment to improve appetite and food intake.

Case Reports

Written informed consent was obtained from both patients and their families, covering both the acupuncture and the publication of clinical details and images. We prepared the report against the CARE checklist [12].

Case 1

A man in his 70s presented with complete anorexia and severe dyspnea during activities of daily living. He had been diagnosed with MAC-PD 7 years earlier at another institution. The diagnosis met the American Thoracic Society/Infectious Diseases Society of America (ATS/IDSA) diagnostic criteria [2,3]: compatible chest radiologic findings, namely bilateral bronchiectasis with small nodules and cavitary lesions predominantly in the upper lobes; repeatedly positive sputum smears for AFB on Ziehl-Neelsen and auramine staining; and repeated growth of mycobacteria from sputum on solid and liquid culture media, the isolate being identified as *Mycobacterium avium* by DNA-DNA hybridization. Serum IgA antibody titers against the glycopeptidolipid (GPL) core were above the diagnostic cutoff point [13]. His past medical history included right-sided pneumothorax and recurrent pneumonia; his family history was unremarkable. Multidrug chemotherapy with clarithromycin 800 mg, rifampicin 450 mg, and ethambutol 750 mg daily was begun at diagnosis, with levofloxacin 500 mg daily added subsequently (**Figure 1**). He was referred to our hospital 4 years later for adjustment of treatment, at which time his height, weight, and BMI were 173 cm, 44.9 kg, and 15.0 kg/m^2, respectively.

At referral, the regimen was changed to azithromycin 500 mg 3 times weekly, with moxifloxacin 400 mg daily, and amikacin 200 mg was given intravenously and subsequently by inhalation; tobramycin 180 mg (intravenous and inhaled) and sitafloxacin 100 mg daily were added later (**Figure 1**). Over the following 2 years, laboratory biomarkers, including erythrocyte sedimentation rate (ESR), anti-GPL core antibody, anti-*Mycobacterium* glycolipid (MBGL) antibody, and sputum AFB smear results, remained relatively stable (**Figure 2**), but radiographic findings gradually worsened (**Figure 3**), and he required 4 hospitalizations for pneumonia. Sputum smears remained positive for AFB, and clarithromycin resistance subsequently developed.

Following a fifth hospitalization, complicated by pneumothorax and pleurisy, the patient developed severe early satiety, postprandial pain, and complete anorexia unresponsive to nutritional supplementation, together with marked dyspnea on minimal exertion (oxygen saturation falling from 95% to

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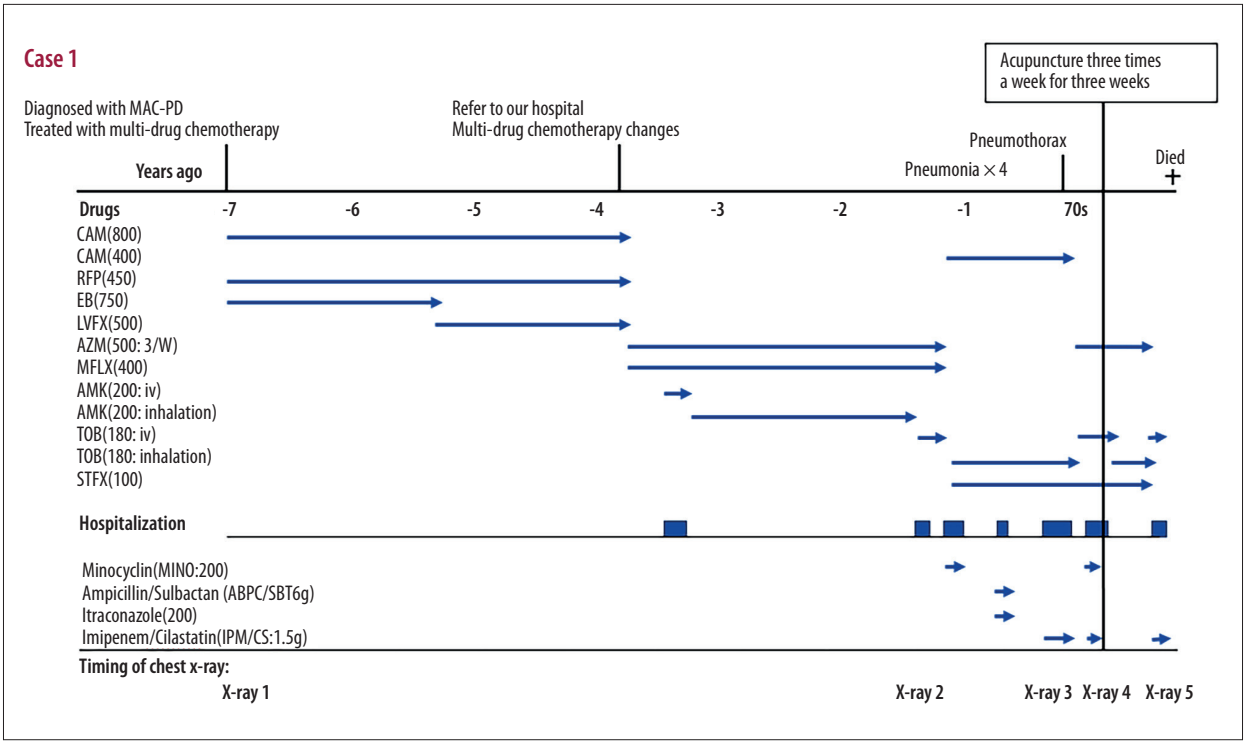

Figure 1. Case 1: timeline of a man in his 70s with *Mycobacterium avium-intracellulare* complex pulmonary disease (MAC-PD), from diagnosis to death. The horizontal axis shows time in years relative to the year in which the patient was in his 70s. Horizontal arrows mark the periods during which each drug was given; the number in parentheses is the daily dose in mg unless stated otherwise. Blue blocks mark periods of hospital admission. The vertical line marks the start of acupuncture, which was given 3 times a week for 3 weeks. Labels along the lower axis show when each of the 5 chest radiographs reproduced in Figure 3 was taken. CAM, clarithromycin; RFP, rifampicin; EB, ethambutol; LVFX, levofloxacin; AZM, azithromycin; MFLX, moxifloxacin; AMK, amikacin; TOB, tobramycin; STFX, sitafloxacin; MINO, minocycline; ABPC/SBT, ampicillin/sulbactam; IPM/CS, imipenem/cilastatin; iv, intravenous; 3/W, 3 times a week.

85%). At this point, his body weight had fallen to 35.4 kg (BMI 11.8 kg/m^2), 9.5 kg below the weight recorded at referral. As no further pharmacological option was available for his anorexia, acupuncture was offered and started for 3 times weekly for 3 weeks (9 sessions), after written informed consent was obtained.

The sessions were given by an acupuncturist holding a Japanese national licence and with more than 10 years in practice. The points to use were decided patient by patient after the 4 traditional East Asian examinations, that is, looking, listening and smelling, questioning, and palpating. In this man, the acupoints selected were CV12 (Zhongwan), ST36 (Zusanli), KI7 (Fuliu), KI3 (Taixi), and LU9 (Taiyuan). Single-use stainless steel needles measuring 40 mm by 0.16 mm were advanced 5 mm to 20 mm and worked by hand until he reported deqi, the tingling, numb, or heavy feeling that signals arrival, after which each needle was turned in 1 direction for roughly 3 minutes. A session took about 50 minutes. Nothing else changed over the 3 weeks: the chemotherapy, oxygen, and remainder of his care went on exactly as before.

Appetite was rated on a 100-mm visual analogue scale (VAS) on which 0 mm indicated the best possible appetite and 100 mm, no appetite at all. The mean of 9 ratings obtained over 3 consecutive days before and after the course was used [14]; daily energy intake was estimated by a registered dietitian from the electronic medical record and averaged over the same 3-day periods [15]. He noticed less abdominal fullness and less breathlessness at meals during the second week. Over the 3-week period, appetite improved, as indicated by a decrease in the appetite VAS from 100 to 32 mm, while measured energy intake increased from 731 to 1440 kcal/day. Body weight rose from 35.4 to 36.6 kg (BMI 11.8 to 12.2 kg/m^2), and serum albumin increased from 2.3 to 2.6 g/dL. Anti-GPL core antibody fell from 2.4 to 1.5 U/mL, but C-reactive protein (CRP) levels rose from 3.4 to 4.8 mg/dL, anti-MBGL antibody rose from 10.4 to 14.2 U/mL, and plasma norepinephrine remained high (1159 and 1230 pg/mL). The sputum AFB smear grade did not change. The indices of systemic inflammation and of mycobacterial disease activity therefore did not improve (**Table 1, Figure 2**). He was asked after every session about bleeding, hematoma, faintness, and any increase in pain. None had occurred, and

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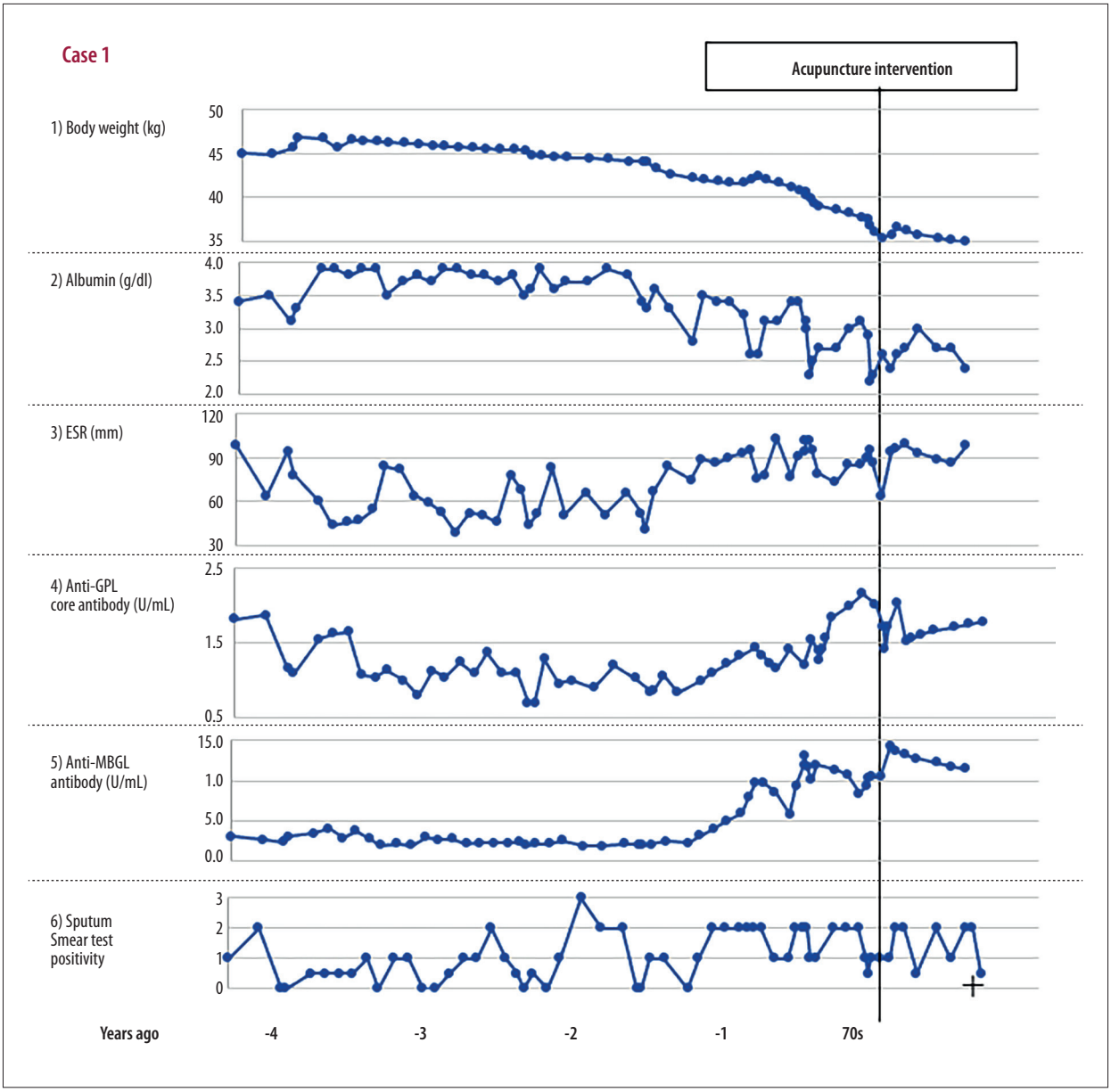

Figure 2. Case 1: serial changes in body weight, laboratory findings, and sputum smear grade during multidrug chemotherapy in a man in his 70s with MAC-PD. Panels show (1) body weight (kg), (2) serum albumin (g/dL), (3) erythrocyte sedimentation rate (ESR, mm/h), (4) serum IgA antibody titer against the glycopeptidolipid core (anti-GPL core antibody, U/mL), (5) serum IgG antibody titer against Mycobacterium glycolipid (anti-MBGL antibody, U/mL), and (6) sputum smear grade for acid-fast bacilli (AFB), scored as 0 for a negative smear, 0.5 for a trace result, and 1, 2 and 3 for 1+, 2+ and 3+, respectively. The horizontal axis shows time in years relative to the year in which the patient was in his 70s. The vertical line marks the start of acupuncture; weekly sessions were continued for 6 months after the initial 3-week course. The cross in panel 6 marks the patient's death.

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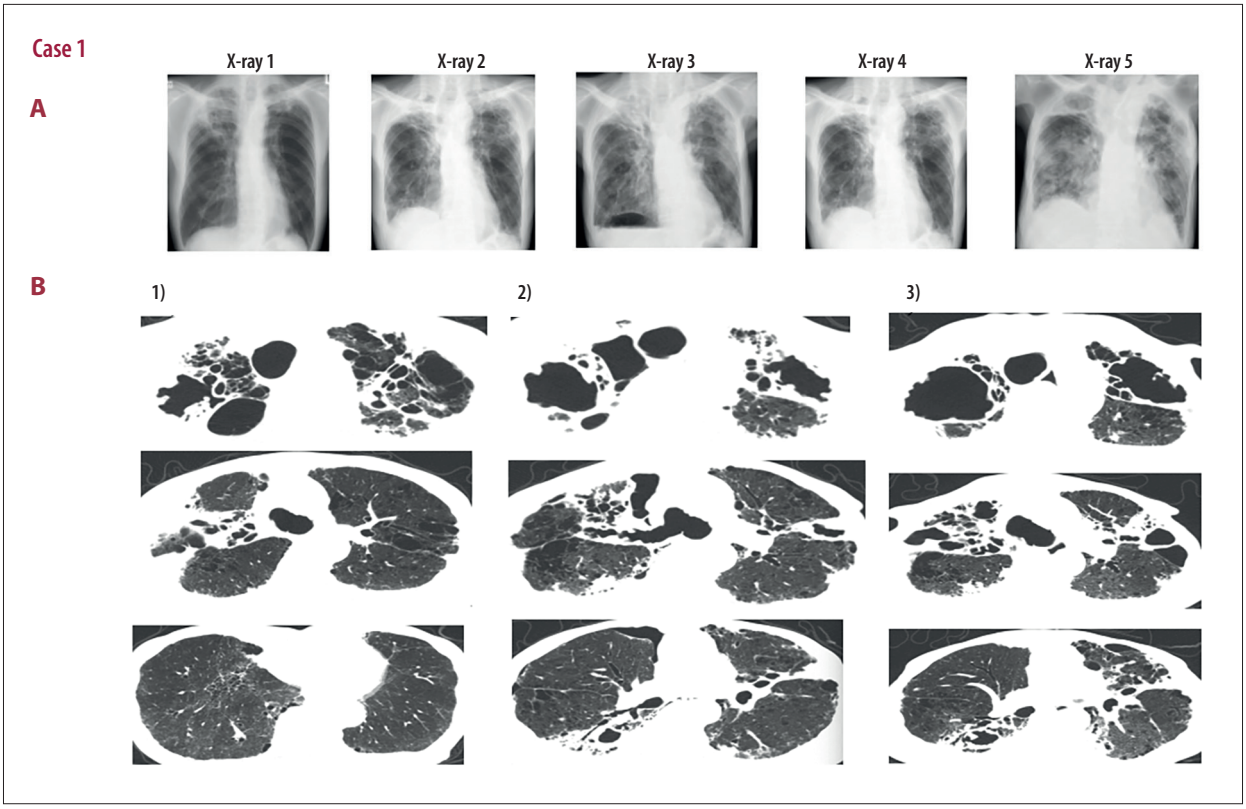

Figure 3. Case 1: serial chest imaging showing progression of MAC-PD in a man in his 70s. (**A**) Chest radiographs. X-ray 1, at diagnosis of MAC-PD; X-ray 2, at transfer to our hospital; X-ray 3, at the time of the right pneumothorax and pleurisy; X-ray 4, at the start of acupuncture; X-ray 5, shortly before death. (**B**) Chest computed tomography (CT) at 3 of these time points: (1) at transfer to our hospital, (2) at the pneumothorax and pleurisy, and (3) shortly before death. Bilateral bronchiectasis, small nodules and cavitary lesions are present throughout and increase in extent from (1) to (3).

Table 1. Case 1: appetite, food intake, body weight, and laboratory findings before and after a 3-week course of acupuncture in a man in his 70s with refractory *Mycobacterium avium-intracellulare* complex pulmonary disease (MAC-PD). Values were obtained in the 3 days before the first session and in the 3 days after the ninth session. Appetite was rated on a 100-mm visual analog scale (VAS) on which 0 mm indicates the best possible appetite and 100 mm indicates no appetite at all.

	Pre-acupuncture	Post-acupuncture
Appetite (VAS: mm)	100	32
Food intake (Kcal/day)	731	1440
Body weight (kg)	35.4	36.6
Height (cm)	173	
BMI (kg/m^2)	11.8	12.2
Hematology		
WBC (/μl)	8850	7240
Neutrophil (%)	78.1	75.1
RBC (×10^4/μl)	413	369
Hemoglobin (g/dl)	12.3	11.1
Hematocrit (%)	39.5	35.8
Platelets (×10^4/μl)	42.7	37.1
RDW (%)	13.8	14.5

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Table 1 continued. Case 1: appetite, food intake, body weight, and laboratory findings before and after a 3-week course of acupuncture in a man in his 70s with refractory *Mycobacterium avium-intracellulare* complex pulmonary disease (MAC-PD). Values were obtained in the 3 days before the first session and in the 3 days after the ninth session. Appetite was rated on a 100-mm visual analog scale (VAS) on which 0 mm indicates the best possible appetite and 100 mm indicates no appetite at all.

	Pre-acupuncture	Post-acupuncture
Biochemistry		
Albumin (g/dl)	2.3	2.6
Prealbumin (mg/dl)	n/a	n/a
RBP (mg/dl)	n/a	n/a
Total bilirubin (mg/dl)	0.48	0.45
AST (IU/l)	30	24
ALT (IU/l)	8	16
LDH (IU/l)	232	195
CPK (IU/l)	n/a	29
BUN (mg/dl)	23.1	16.5
Creatinine (mg/dl)	0.88	0.67
Glucose (mg/dl)	n/a	89
Epinephrine (pg/ml)	140	62
Norepinephrine (pg/ml)	1159	1230
Dopamine (pg/ml)	53	47
Serology		
CRP (mg/dl)	3.4	4.8
β-D-glucan(pg/ml)	16.6	n/a
Aspergillus antigen (index)	0.8	0.9
KL-6 (U/ml)	833	715
SP-D (ng/ml)	n/a	n/a
Anti-GPL core antibody (U/ml)	2.4	1.5
Anti-MBGL antibody (U/ml)	10.4	14.2
Urinary catecholamine		
Epinephrine (μg/day)	n/a	n/a
Norepinephrine (μg/day)	n/a	n/a
Dopamine (μg/day)	n/a	n/a

Appetite was assessed with a 100-mm visual analogue scale (VAS), on which 0 mm indicated the best possible appetite and 100 mm indicated no appetite at all [14]; and the mean of nine ratings taken over three consecutive days before and after treatment was calculated. Daily caloric intake was estimated by a registered dietitian from the electronic medical record, averaged over the same 3-day periods [15]. Abbreviations: BMI, body mass index; WBC, white blood cell count; RBC, red blood cell count; RDW, red cell distribution width; AST, aspartate aminotransferase; ALT, alanine aminotransferase; LDH, lactate dehydrogenase; CPK, creatine phosphokinase; BUN, blood urea nitrogen; RBP, retinol-binding protein; CRP, C-reactive protein; KL-6, Krebs von den Lungen-6; SP-D, surfactant protein D; anti-GPL core antibody, serum IgA antibody against the glycopeptidolipid core; anti-MBGL antibody, serum IgG antibody against *Mycobacterium* glycolipid; n/a, not available.

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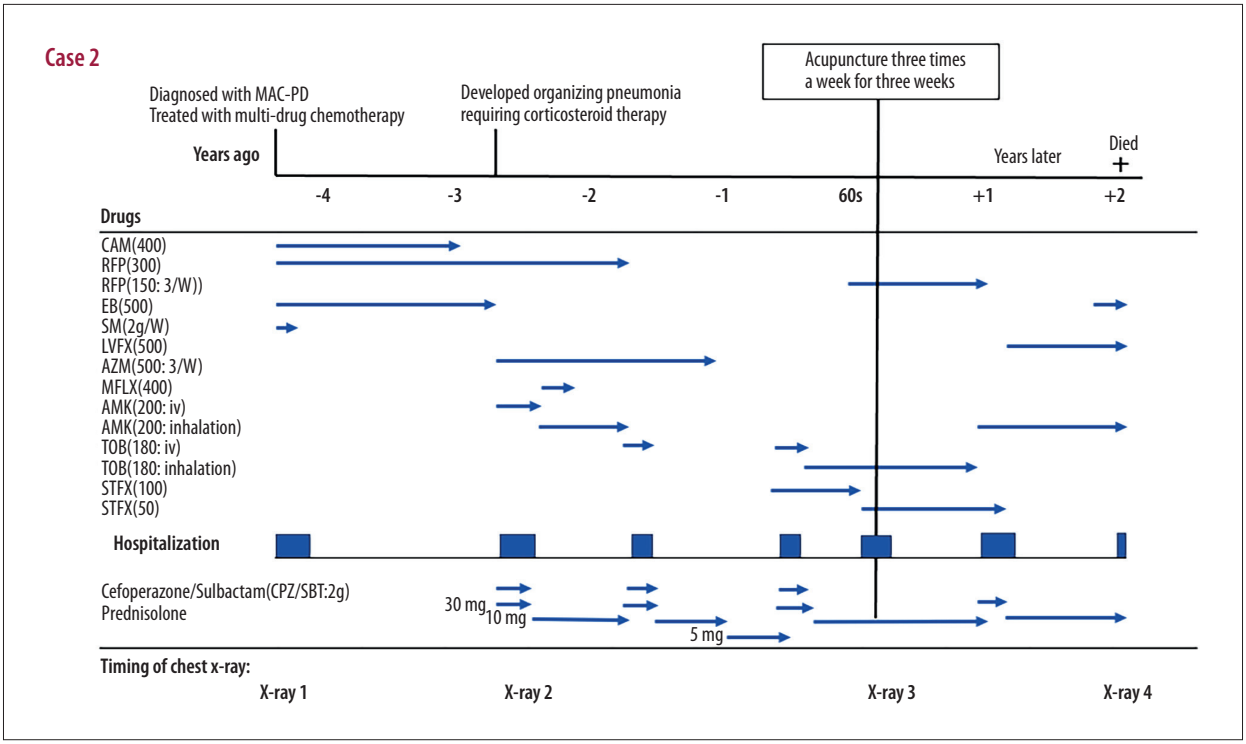

Figure 4. Case 2: timeline of a woman in her 60s with MAC-PD complicated by organizing pneumonia, from diagnosis to death. The horizontal axis shows time in years relative to the year in which the patient was in her 60s. Horizontal arrows mark the periods during which each drug was given; the number in parentheses is the daily dose in mg unless stated otherwise. Blue blocks mark periods of hospital admission. The vertical line marks the start of acupuncture, which was given three times a week for 3 weeks. Labels along the lower axis show when each of the 4 chest radiographs shown in Figure 5 was taken. CAM, clarithromycin; RFP, rifampicin; EB, ethambutol; SM, streptomycin; LVFX, levofloxacin; AZM, azithromycin; MFLX, moxifloxacin; AMK, amikacin; TOB, tobramycin; STFX, sitafloxacin; CPZ/SBT, cefoperazone/sulbactam; Predonine, prednisolone; iv, intravenous; 3/W, three times a week; W, week.

no other event attributable to the needling arose during the 3 weeks or during the follow-up that came after.

He then completed a course of pulmonary rehabilitation and underwent home long-term oxygen therapy, continuing acupuncture once a week. He remained clinically stable for about 6 months, after which the radiographic lesions extended again and his weight fell. He died of respiratory failure caused by MAC-PD 204 days after the first acupuncture session.

Case 2

A woman in her 60s reported experiencing loss of appetite, abdominal pain after meals, and breathlessness on exertion. MAC-PD had been diagnosed 4 years before the acupuncture course (**Figure 4**), on the same clinical, radiological, and microbiological grounds as in case 1 [2,3]. She had undergone left lower lobectomy for lung cancer before the diagnosis of MAC-PD (**Figure 5**). Chest radiography and computed tomography (CT) showed bronchiectasis, multiple small nodules, and cavities on both sides (**Figure 5**). The sputum smears were persistently positive for AFB, and the organism recovered on repeated culture was identified as *Mycobacterium intracellulare* by DNA-DNA hybridization. Both serum antibody titers, anti-GPL core and anti-MBGL, were above their respective diagnostic cutoff points [13]. She weighed 38.9 kg at that time, with a BMI of 16.6 kg/m^2.

Clarithromycin 400 mg, rifampicin 300 mg, and ethambutol 500 mg daily were started at diagnosis. The lesions nevertheless extended, and the regimen was changed repeatedly, to azithromycin 500 mg 3 times a week, then to amikacin 200 mg given intravenously and by inhalation, tobramycin 180 mg by inhalation, and sitafloxacin and rifampicin 150 mg 3 times a week (**Figure 4**). Approximately 18 months after diagnosis, she developed organizing pneumonia that required prednisolone, begun at 30 mg/day and tapered to 10 mg and then 5 mg/day, which was continued thereafter.

Abdominal discomfort and breathlessness during meals persisted and her appetite deteriorated further. By the time of the admission, when acupuncture was given, her weight had

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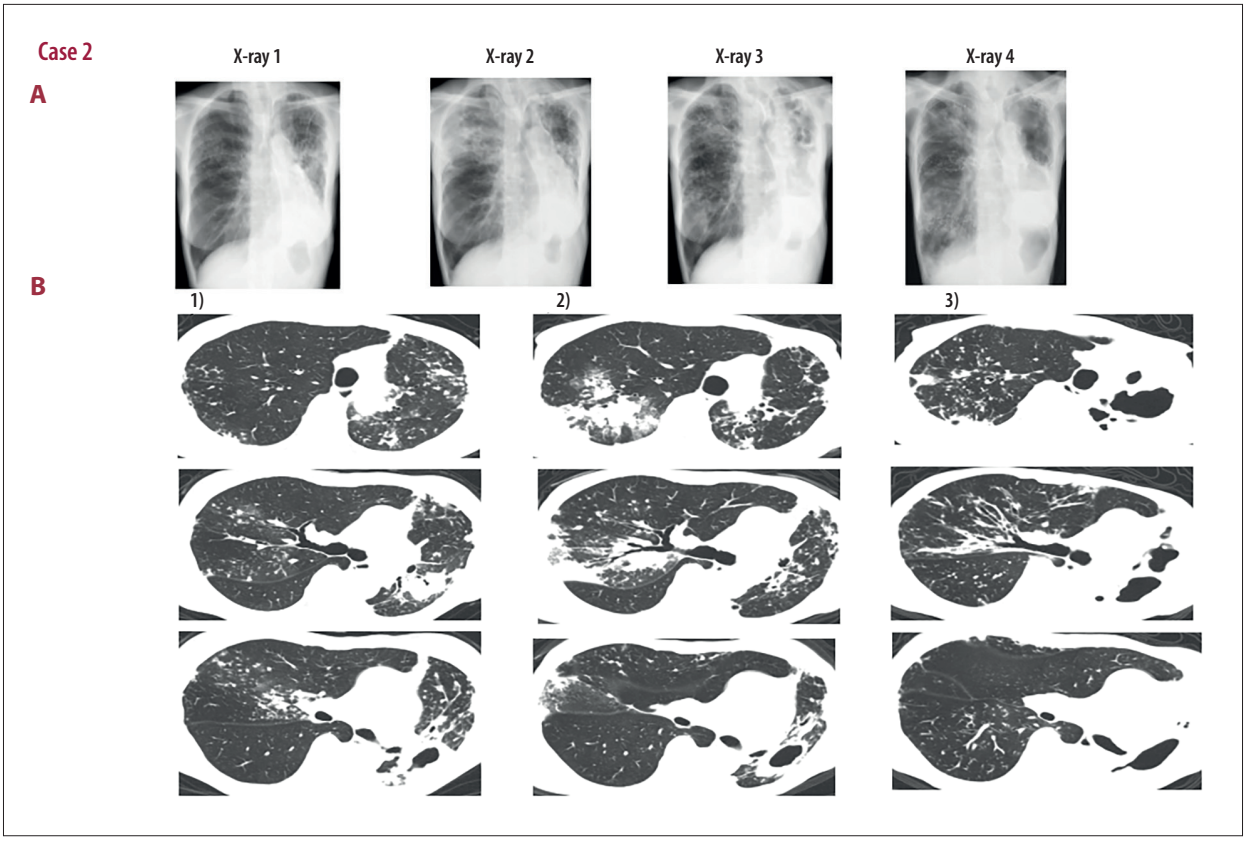

Figure 5. Case 2: serial chest imaging showing progression of MAC-PD in a woman in her 60s. (**A**) Chest radiographs. X-ray 1, at onset of MAC-PD; X-ray 2, at the onset of organizing pneumonia; X-ray 3, at the start of the acupuncture course; X-ray 4, approximately 1 year after the acupuncture course, when the lesions had progressed to a giant cavity and pulmonary mycosis due to *Aspergillus fumigatus* was diagnosed. (**B**) Chest computed tomography (CT) at (1) the diagnosis of MAC-PD, (2) the onset of organizing pneumonia, and (3) approximately 1 year after the acupuncture course, when the giant cavity had formed. Bilateral bronchiectasis and cavitary lesions increase in extent from (1) to (3). The appearance of the left hemithorax reflects a previous left lower lobectomy for lung cancer.

fallen to 31.0 kg (BMI 13.2 kg/m^2), 7.9 kg below the weight at diagnosis.

Acupuncture was given during that admission 3 times a week for 3 weeks, after written informed consent was obtained from the patient. Appetite and energy intake were measured exactly as in case 1 [14,15]. The points selected for her were CV12, ST36, LI11 (Quchi), SP6 (Sanyinjiao), and LU9. Needle size, insertion depth, manual technique, and session length were the same as in case 1, and no other treatment was altered. She, too, was asked after every session about bleeding, hematoma, faintness, and any increase in pain, and no adverse event of any kind was observed.

After the 9 sessions, her abdominal symptoms and her breathlessness at meals had improved. Appetite improved, as reflected by a decrease in the appetite VAS from 72 to 53 mm, while energy intake increased from 1194 to 1495 kcal/day. Body weight rose from 31.0 to 31.7 kg (BMI 13.2 to 13.5 kg/m^2), serum albumin from 3.0 to 3.4 g/dL, prealbumin from 10.3 to 11.2 mg/dL, and retinol-binding protein from 1.2 to 1.4 mg/dL. CRP level fell from 4.5 to 1.3 mg/dL. In the 24-hour urine collection, dopamine rose from 1052 to 1854 µg/day, while norepinephrine fell from 338 to 221 µg/day, and epinephrine from 15.7 to 7.6 µg/day. Plasma norepinephrine rose from 1213 to 1544 pg/mL, while plasma epinephrine fell from 50 to 35 pg/mL, and plasma dopamine changed little (27 to 33 pg/mL). Anti-GPL core and anti-MBGL antibody titers and the sputum smear grade did not change (**Table 2, Figure 6**).

She was discharged and remained stable for approximately a year, attending the outpatient clinic every month. The radiographic cavity lesions progressively enlarged into a giant cavity, and pulmonary mycosis due to *Aspergillus fumigatus* was diagnosed (**Figure 5**). She died of this infection, compounded by progressive cachexia, 2 years after the acupuncture treatment.

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Table 2. Case 2: appetite, food intake, body weight, and laboratory findings before and after a 3-week course of acupuncture in a woman in her 60s with refractory MAC-PD. Values were obtained over the same intervals and the abbreviations are as defined for Table 1. Urinary catecholamines were measured in 24-hour urine collections.

	Pre-acupuncture	Post-acupuncture
Appetite (VAS: mm)	72	53
Food intake (Kcal/day)	1194	1495
Body weight (kg)	31	31.7
Height (cm)	153	
BMI (kg/m^2)	13.2	13.5
Hematology		
WBC (/μl)	6130	7600
Neutrophil (%)	75.9	79.3
RBC (×10^4/μl)	475	491
Hemoglobin (g/dl)	10.8	11.2
Hematocrit (%)	34.9	36.2
Platelets (×10^4/μl)	39.1	38.2
RDW (%)	15.6	15.5
Biochemistry		
Albumin (g/dl)	3	3.4
Prealbumin (mg/dl)	10.3	11.2
RBP (mg/dl)	1.2	1.4
Total bilirubin (mg/dl)	0.59	0.71
AST (IU/l)	19	21
ALT (IU/l)	13	13
LDH (IU/l)	253	223
CPK (IU/l)	20	27
BUN (mg/dl)	9.6	11.2
Creatinine (mg/dl)	0.55	0.52
Glucose (mg/dl)	77	83
Epinephrine (pg/ml)	50	35
Norepinephrine (pg/ml)	1213	1544
Dopamine (pg/ml)	27	33
Serology		
CRP (mg/dl)	4.5	1.3
β-D-glucan(pg/ml)	< 5	n/a
Aspergillus antigen (index)	0.3	n/a
KL-6 (U/ml)	1223	1416
SP-D (ng/ml)	204	320
Anti-GPL core antibody (U/ml)	2.2	1.9
Anti-MBGL antibody (U/ml)	10	11.3

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Table 2. Case 2: appetite, food intake, body weight, and laboratory findings before and after a 3-week course of acupuncture in a woman in her 60s with refractory Mycobacterium MAC-PD. Values were obtained over the same intervals and the abbreviations are as defined for Table 1. Urinary catecholamines were measured in 24-hour urine collections.

	Pre-acupuncture	Post-acupuncture
Urinary catecholamine		
Epinephrine (μg/day)	15.7	7.6
Norepinephrine (μg/day)	338	221
Dopamine (μg/day)	1052	1854

Appetite was assessed with a 100-mm visual analogue scale (VAS), on which 0 mm indicated the best possible appetite and 100 mm indicated no appetite at all [14]; and the mean of nine ratings taken over three consecutive days before and after treatment was calculated. Daily caloric intake was estimated by a registered dietitian from the electronic medical record, averaged over the same 3-day periods [15]. Abbreviations: BMI, body mass index; WBC, white blood cell count; RBC, red blood cell count; RDW, red cell distribution width; AST, aspartate aminotransferase; ALT, alanine aminotransferase; LDH, lactate dehydrogenase; CPK, creatine phosphokinase; BUN, blood urea nitrogen; RBP, retinol-binding protein; CRP, C-reactive protein; KL-6, Krebs von den Lungen-6; SP-D, surfactant protein D; anti-GPL core antibody, serum IgA antibody against the glycopeptidolipid core; anti-MBGL antibody, serum IgG antibody against *Mycobacterium* glycolipid.

Discussion

In both patients, appetite and food intake improved within 3 weeks of starting acupuncture, at a stage at which dietary advice and oral supplements had failed and no further pharmacological option was available. Body weight and serum albumin levels rose in parallel, and no adverse event occurred. Over the same period, the sputum acid-fast bacillus smear grade and chest radiographic findings were unchanged in both patients. In case 2, the anti-GPL core and anti-MBGL antibody titers were essentially unchanged (2.2 to 1.9 and 10.0 to 11.3 U/mL, respectively). In case 1, the 2 markers moved in opposite directions, with the anti-GPL core antibody titer falling from 2.4 to 1.5 U/mL, while the anti-MBGL antibody titer rose from 10.4 to 14.2 U/mL, so that no consistent change in mycobacterial disease activity could be demonstrated in either patient. Because the anti-MBGL antibody titer reflects the severity and progression of MAC-PD [6], the absence of any improvement in this titer in either patient indicates that what changed was symptom burden and nutritional intake rather than the mycobacterial disease itself. Acupuncture is therefore regarded here as supportive care and not as antimycobacterial treatment.

The points CV12 and ST36 were used in both patients because needling at these points modulates gastric and intestinal motility and secretion through autonomic reflexes [16-22]; LU9 was added for respiratory discomfort, and KI3 and KI7 in case 1, and LI11 and SP6 in case 2 were chosen individually after the 4 traditional East Asian examinations. Case 1 had marked sympathetic hyperactivity before treatment, with resting plasma norepinephrine above 1100 pg/mL, higher than the concentrations reported in severe heart failure and in advanced COPD [23-25], and in case 2 the 24-hour urinary norepinephrine excretion was correspondingly raised; such activity delays gastric emptying and may have contributed to the early satiety, postprandial pain, and anorexia. In case 2, urinary norepinephrine and epinephrine and CRP levels fell after the course, although plasma norepinephrine rose over the same period, and meal-related dyspnea lessened in both patients, as previously observed after acupuncture in COPD [26]. These findings are hypothesis-generating only: plasma norepinephrine did not fall in either patient (case 1, 1159 to 1230 pg/mL; case 2, 1213 to 1544 pg/mL); therefore, the urinary and plasma catecholamine changes in case 2 were discordant, and the needles were stimulated manually rather than electrically. The overall pattern, symptomatic and nutritional improvement without change in disease activity, resembles that reported in randomized trials in stable COPD [8,9] and in advanced cancer [10]. To our knowledge, acupuncture for anorexia and cachexia in MAC-PD has not previously been reported.

This report is limited to 2 patients and included no control condition. Appetite fluctuates in hospitalized patients, and a response to attention alone cannot be excluded; therefore, the improvements cannot be attributed with certainty to the acupuncture treatment. Both patients were inpatients with far-advanced disease and severe meal-related dyspnea. Whether patients at an earlier stage would respond similarly is unknown. The weight gain in the 2 patients was small (1.2 kg and 0.7 kg) and was not sustained beyond 6 months in case 1, and neither patient survived. Prospective controlled studies are required before acupuncture can be recommended as adjunctive therapy for anorexia and cachexia in refractory MAC-PD.

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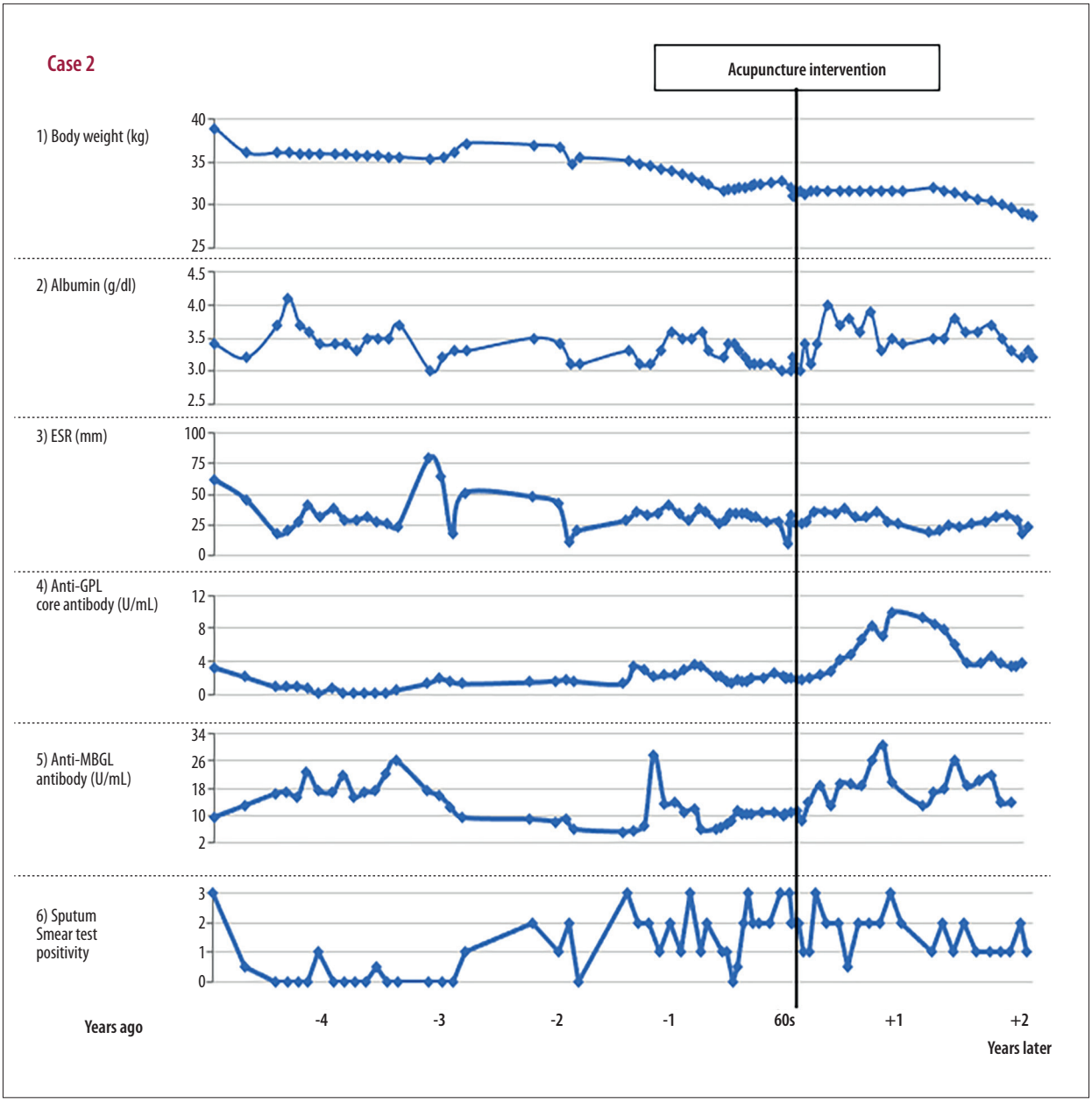

Figure 6. Case 2: serial changes in body weight, laboratory findings, and sputum smear grade during multidrug chemotherapy in a woman in her 60s with MAC-PD. Panels show (1) body weight (kg), (2) serum albumin (g/dL), (3) erythrocyte sedimentation rate (ESR, mm/h), (4) serum IgA antibody titer against the glycopeptidolipid core (anti-GPL core antibody, U/mL), (5) serum IgG antibody titer against *Mycobacterium* glycolipid (anti-MBGL antibody, U/mL), and (6) sputum smear grade for AFB, scored as 0 for a negative smear, 0.5 for a trace result, and 1, 2 and 3 for 1+, 2+ and 3+, respectively. The horizontal axis shows time in years relative to the year in which the patient was in her 60s. The vertical line marks the start of acupuncture.

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Conclusions

In 2 older adult patients with advanced, refractory MAC-PD and severe cachexia, a short course of acupuncture was temporally associated with improved gastrointestinal symptoms, meal-related dyspnea, appetite, food intake, and nutritional biomarkers, without a measurable effect on microbiological status or radiographic progression. Acupuncture may be a useful adjunctive option for anorexia and cachexia in patients with refractory MAC-PD, but this observation requires confirmation in larger, controlled, prospective studies.

Department and Institution Where Work Was Done

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Patient Consent

Both patients in this report died. Written informed consent for publication of this case report was obtained from the patients' next of kin after a full explanation of the nature and purpose of this report. Each patient signed consent both for the treatment itself and for publication of the clinical details and images reproduced here. The report was approved by the Institutional Review Board of the NHO Osaka Toneyama Medical Center (approval number 1580; UMIN000044859).

Declaration of the Use of Generative Artificial Intelligence

A large language model (Claude, Anthropic, San Francisco, CA, USA) was used while this manuscript was being prepared. Its role was confined to editing the English, improving readability, and cross-checking statements in the text against the values in our tables and figures. It did not generate clinical data, choose or interpret the references, or contribute to any conclusion drawn here. The authors checked every statement against the original clinical records, rewrote the text themselves, and accept full responsibility for its accuracy, originality and integrity.

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Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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