



Figure 1. Ulcer in the trochanteric region before (A) and after (B) eight carbon dioxide treatments.

off-label manner to treat several conditions, including peripheral arterial disease, venous insufficiency, and leg ulcers.^{4,5}

Regarding local complications, there are reports in the literature of erythema, ecchymosis, pain, and a sensation of crepitation resulting from CO₂ therapy. Danger of gas emboli with CO₂ injections has not been reported.

The treatment is especially beneficial for elderly adults with pressure ulcers due to immobility because they may have injections at home, avoiding hospitalization. The technique can improve tissue oxygenation, contributing to ulcer healing.

CONCLUSION

Carbon dioxide therapy may be a safe option for the treatment of pressure ulcers. It is a rapidly effective, low-cost technique that is easy to perform and has a low risk of side effects. Randomized controlled studies are required to provide further evidence of the effectiveness of CO₂ therapy in elderly adults with pressure ulcers.

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SUCCESSFUL TREATMENT OF POSTSTROKE EMOTIONAL INCONTINENCE WITH YOKUKANSAN, AN ASIAN HERBAL MEDICINE: REPORT OF TWO CASES

To the Editor: Emotional incontinence (EI) is a neurological condition characterized by uncontrollable episodes of crying or laughing that often occur in individuals with neurological disorders such as traumatic brain injury, stroke, and Alzheimer's disease. In particular, EI after a stroke is one of the most frequently reported poststroke behavioral syndromes, and the prevalence of EI within 1 year after a stroke is 20%.¹ There is a pressing need for the development of new treatments for poststroke EI, because emotional disturbances, including EI, are associated with less-successful outcomes of rehabilitation therapy, poorer quality of life, and higher caregiver burden, but no effective drug therapy for poststroke EI has yet been established.

Recently, yokukansan, an Asian herbal medicine (Kampo in Japanese), was reported to improve the behavioral and psychological symptoms of dementia (BPSD), such as aggression, agitation, irritability, and hallucinations in individuals with Alzheimer's disease and other forms of senile dementia.^{2,3} Herein, two cases we presented that were successfully treated for poststroke EI using yokukansan.

CASE 1

A 74-year-old man was admitted to the hospital due to sudden onset of slurred speech followed by moderate impairment of consciousness. Magnetic resonance imaging (MRI) revealed an acute infarct in the right lateral thalamus. Two days after admission, he displayed intense EI; he began to cry in response to stimuli that normally did not trigger crying, such as door-closing sounds and greetings in the morning. Four weeks after admission, he became delirious every night, and the neurologist gave him quetiapine (25 mg/d). The delirium subsided in a few days but delirium relapsed 1 week after the start of treatment with quetiapine. Six weeks after the stroke, the authors were consulted regarding treatment of the delirious state. Yokukansan (7.5 g/d) was added for treatment of the delirium, which gradually subsided within a week. Unexpectedly, EI also gradually subsided and had completely disappeared 2 weeks after the start of treatment with yokukansan. He stopped taking yokukansan while staying at home for 3 days, and EI relapsed after returning to the hospital. EI subsided within 1 week after yokukansan administration was restarted.

CASE 2

A 78-year-old woman was admitted to the hospital because of sudden onset of left hemiplegia and impaired consciousness. MRI showed an acute infarct in the right middle cerebral artery (MCA)-anterior cerebral artery (ACA) watershed territory. Four months after stroke onset, she often displayed involuntary crying (EI) whenever she saw family or staff members in the hospital. She also experienced visual hallucinations of snakes, followed by insomnia. Five months after stroke onset, the authors were consulted regarding treatment for her psychiatric symptoms. Antipsychotic medications (quetiapine 25 mg/d or oxyperline 20 mg/d) did not ameliorate the visual hallucinations but caused oversedation. Yokukansan (7.5 g/d) was administered for treatment of the visual hallucinations, but her involuntary crying unexpectedly subsided a week after the start of yokukansan treatment, without oversedation. Complaints about snakes gradually subsided, and the visual hallucinations had disappeared by 1 month after the start of yokukansan treatment.

DISCUSSION

To the best of the knowledge of the authors of this letter, this is the first report showing that yokukansan can improve poststroke EI. Yokukansan was prescribed for two individuals with stroke to treat BPSD, and the improvement in EI was an unexpected outcome. In both cases, EI, which had been present for longer than 1 month,

completely disappeared within 1 to 2 weeks after starting yokukansan treatment. Because yokukansan has a slow-onset pharmacological effect,⁴⁻⁶ it is conceivable that it improved EI in both of our cases. In Case 1 particularly, poststroke EI relapsed after he stopped taking yokukansan, and restarting this treatment improved EI, suggesting that yokukansan was effective for poststroke EI in this case.

The mechanism by which yokukansan improves EI is not clear. It contains several herbal medicines, including *atractylodis lanceae rhizoma*, *poria, cnidii rhizoma*, *angelicae radix*, *glycyrrhizae radix*, and *uncariae uncis cum ramulus*. Of these herbal medicines, *angelicae radix* and *uncariae uncis cum ramulus* have been shown to affect serotonin receptors,^{7,8} although the precise chemical constituents of yokukansan are still under investigation. There are also reports showing that selective serotonin reuptake inhibitors improve EI, suggesting that EI involves the serotonin system.^{9,10} Taking these observations together, yokukansan may improve poststroke EI through activation of serotonin systems.

Two poststroke EI cases treated with yokukansan are presented. Further studies are required to evaluate the effect of yokukansan on poststroke EI.

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TYPE II ODONTOID FRACTURE IN A NONAGENARIAN

To the Editor: The elderly spine, weakened by age-related degeneration and osteoporosis, is inherently prone to upper cervical trauma associated with low-energy injuries.¹ The junction between the body of axis and the odontoid process is most vulnerable, and fractures across this junction, known as type II odontoid fractures, are the most common spinal fractures for individuals aged 80 and older.² Because of the associated ligamentous disruption, type II odontoid fracture is generally considered unstable.² Despite this, controversy remains regarding its optimal management in elderly adults. Significant variability exists in clinical practice, from the minimalist approach of harm reduction and palliation to advocacy of early surgery to avoid fatal complications and facilitate early rehabilitation. A case of a nonagenarian who sustained a displaced type II odontoid fracture is presented. Despite his extreme old age and comorbidities, he made an excellent recovery through aggressive early surgical treatment. This favorable surgical outcome, despite the perceived risks and futility, highlights the dangers of withholding potentially life-saving surgical intervention in extremely elderly adults.

CASE REPORT

A 98-year-old previously independent man presented to the hospital after an unwitnessed fall. His past medical history included ischemic heart disease and chronic airflow limitation that were both controlled medically. He complained of pain in his neck and left shoulder on presentation. On examination, he exhibited good motor responses to commands except for some generalized effort-related left upper limb weakness (2/5) due to a rotator cuff injury. There was no definite sensory level detected. A trauma survey revealed no other significant injuries. His subsequent imaging showed a displaced type II odontoid frac-

ture resulting in significant C1/C2 retrolisthesis (50%) and spinal cord contusion (Figure 1).

In view of his good premorbid functional status, he was brought to the operating room emergently. The fracture was reduced and stabilized using C1–C4 posterior instrumentation. A C1–C3 laminectomy was performed to ensure spinal cord decompression.

Postoperatively, the patient had made an uneventful recovery. He was able to resume full independent mobility after 6 weeks of inpatient rehabilitation. He was discharged home and remained independent at 12-month follow-up.

DISCUSSION

The management of type II odontoid fracture in elderly adults is controversial. Advocates of early surgical treatment believe that surgery provides the best chance of osseous union, allows safe and early mobilization, and ultimately reduces morbidity and mortality.³ In contrast, proponents for nonoperative treatment argue that non-union is an acceptable outcome in sedentary elderly adults, notwithstanding the associated instability. The operative risks associated with age-related comorbidities inevitably outweigh the benefits of surgery in many cases.⁴

Why are there such conflicting opinions regarding the management of type II odontoid fractures in elderly adults? One reason for this confusion springs from the fact that the body of literature concerning type II odontoid fractures consists largely of retrospective series limited by selection bias, incomplete follow-up, and patient heterogeneity.^{5–7} As reported in a Cochrane review, the lack of prospective data for odontoid fractures has prohibited any meaningful comparison between surgery and nonoperative treatment as the preferred treatment modality.⁸ This is in sharp contrast to the volume and quality of reviews and trials available for femoral neck fractures despite a similar increase in incidence in the aging population.

Second, type II odontoid fractures are a highly heterogeneous group of fractures, not only in morphological terms, but also in many associated anatomical and clinical



Figure 1. Left. Sagittal computed tomography (CT) scan of the cervical spine showing the dorsally displaced odontoid fracture at the junction between the odontoid process and the body of axis. Middle. Sagittal T2 magnetic resonance imaging scan demonstrating swelling and signal changes in the spinal cord posterior to the site of the fracture in keeping with a spinal cord contusion. Right. Postoperative sagittal CT scan demonstrating reduction of the fracture and C1–C3 posterior decompression.