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Cellular Transplants in China: Observational Study from the Largest Human Experiment in Chronic Spinal Cord Injury

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Background. In China, fetal brain tissue has been transplanted into the lesions of more than 400 patients with spinal cord injury (SCI). Anecdotal reports have been the only basis for assuming that the procedure is safe and effective. *Objective*. To compare available reports to the experiences and objective findings of patients who received preoperative and postoperative assessments before and up to 1 year after receiving cellular implants. *Methods*. Independent observational study of 7 chronic SCI subjects undergoing surgery by Dr Hongyun Huang in Beijing. Assessments included lesion location by magnetic resonance imaging, protocol of the American Spinal Injury Association (ASIA), change in disability, and detailed history of the perioperative course. *Results*. Inclusion and exclusion criteria were not clearly defined, as subjects with myelopathies graded ASIA A through D and of diverse causes were eligible. Cell injection sites did not always correlate with the level of injury and included the frontal lobes of a subject with a high cervical lesion. Complications, including meningitis, occurred in 5 subjects. Transient postoperative hypotonicity may have accounted for some physical changes. No clinically useful sensorimotor, disability, or autonomic improvements were found. *Conclusions*. The phenotype and the fate of the transplanted cells, described as olfactory ensheathing cells, are unknown. Perioperative morbidity and lack of functional benefit were identified as the most serious clinical shortcomings. The procedures observed did not attempt to meet international standards for either a safety or efficacy trial. In the absence of a valid clinical trials protocol, physicians should not recommend this procedure to patients.

Key Words: *Spinal cord injury—Neural transplantation—Regeneration—Rehabilitation—Neuroplasticity—Clinical trials—Fetal olfactory cells.*

Neural cellular transplantation strategies have been studied in patients with cautiously planned safety and randomized controlled trials for Parkinson disease,[1] Alzheimer disease,[2] and stroke.[3] Modest axonal regeneration, remyelination, and nonspecific behavioral effects of implants of a variety of cell types in rat and mouse models of spinal cord injury (SCI), as well as other biologic strategies for neural repair, have increased the expectations of patients and their families that a cure for paralysis is imminent.[4,5] Comparable to other new medical treatments, the promotion of these cell-based interventions should be dependent on rigorously performed

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safety trials followed by well-designed randomized controlled trials that establish efficacy for a defined population of patients.

Dr Hongyun Huang, a neurosurgeon in Beijing, China, has performed cellular transplants in more than 400 patients with SCI and 100 patients with amyotrophic lateral sclerosis (ALS) at Chaoyang and West Hills (Xishan) hospitals. A recent interview with a writer from *Nature* estimated that 3000 Chinese and 1000 foreigners are awaiting his injection of what he describes as olfactory ensheathing cells (OECs) from aborted fetuses.[6] He has verbally stated that no medical complications have occurred and that his patients often improve, usually within 3 days of surgery. Western physicians, scientists, and reporters who have visited Dr Huang since 2003 have not been able to examine a patient's course beyond the 1st few days after surgery; thus, occasional descriptions of modest postoperative improvements are unconfirmed.

THE PROBLEM

Very little scientific and clinical information has been made available to researchers and patients about the experimental procedures employed by Dr Huang, yet the number of patients who have participated in his experiment is far larger than any other cell transplantation strategy for any neurologic disease to date. This report presents clinical data on 7 subjects who had cellular implantations for SCI by Huang and colleagues in 2004 and represents the largest series of cases monitored prospectively by Western physicians. The findings are compared and contrasted to the limited information available in a published article from Dr Huang and colleagues,[7] to comments made by him at a conference, and to media representations of his work. This report about presurgical and postsurgical observations, however, is not a substitute for a randomized controlled trial with defined entry criteria and blinded, predefined outcomes using reliable and relevant measurement tools.[8] The aim is to encourage a realistic evaluation of anecdotes and of experiments performed without controls or placebos in Beijing, as well as provide information to physicians, researchers, patients, disease-oriented advocacy groups, and the media about how to weigh possible human risks and benefits of invasive cell implants for neurologic diseases. The case series also points to directions that the Beijing group could take to design a scientifically valuable study.

Case Reports

Seven patients who had already decided to have surgery by Dr Huang were examined before and 1 or more times within 1 year after their surgical implantations in Beijing. Conventional American Spinal Injury Association (ASIA) tools were used to measure strength, sensation, level of injury, and completeness of SCI. In addition, the subjects were assessed for changes in overall functional independence for self-care, for sensorimotor gains below the injury, and for autonomic and subjective improvements noted by the subjects or their families. Events about the postoperative hospitalization were obtained from subjects and family members who attended them in Beijing. A summary of the 7 patients appears in Table 1.

Subject 1. Before surgery, subject 1 (S1) had high tetraplegia with voluntary movement only in right elbow flexion and bilateral trapezius elevation. The subject was told that cells were injected into the spinal cord at the upper (C-3) and bottom edge (C-5) of myelomalacia, documented by magnetic resonance imaging (MRI). In the 1st postoperative week after cell implantation, the family reported reduced spasms of the arms and legs. However, the 1st 10 days after surgery were complicated by meningitis and confusion. A cerebrospinal fluid pleocytosis persisted during the course of 5 lumbar punctures in the subsequent month. Three months after surgery, right elbow flexor strength was 2 of 5, unchanged from our preoperative assessment. However, S1 believed that this movement had improved. The family also reported that a twitch of wrist extension had developed on the right. At both preoperative and postoperative examinations, however, S1 had slight involuntary motion of several fingers of each hand caused by fasciculation of the intrinsic hand muscles. The family had interpreted these movements as a sign of improvement. The subject increased the range of elbow flexion, but the increase was less than 5°. The maximal speed of biceps contraction for elbow flexion, performed during a limited range of motion of 30° without gravity, had increased from 10 flexions per 30 s to 12 flexions per 30 s, but this movement still rapidly fatigued with any greater number of repetitions. S1 had been practicing this movement daily after surgery as part of a new physical therapy program. A functional MRI scan performed 3 months after surgery showed wider recruitment of activity in bilateral primary sensorimotor cortex compared to preoperatively for this 30° elbow movement,

Table 1. Western Patients with Traumatic Spinal Cord Injury (SCI) Who Received Implants at Chaoyang Hospital, Beijing

Subject	Age at Examination	SCI to Implant, (mo)	Myelomalacia	AIS	Preoperative ASIA Motor Score[a]	Preoperative Pinprick Level[b]	Motor Change (mo after surgery)	Sensory Change	Muscle Tone Change	Functional Change	Postoperative Complications
1	19	9	C3-5	A, C4	3	R,C5-T3;1 L, C5-8;0 T1-T3;1	At 1, 4, and 14 mo, none	None	↓1st week, then same	None	Meningitis, antibiotics; CSF pleocytosis for 1 mo
2	22	13	C1-2	A, C3	0	R,C3:1 L,C2:1	At 3 mo, none	None	↓ 1st week, then same	None	Meningitis, antibiotics; GI bleed; pneumonia; at home, pneumonia
3	22	40	C4-5	C, C5	36	R,T6;0 L,T7;0	At 3 mo, none	None	Marked ↓ for 1st week, then same	None	Meningitis; Stevens-Johnson syndrome to antibiotic
4	35	24	C6-7	D	65 (1/5 ankle dorsiflexion)	Intact	At 6 mo, 2/5 ankle dorsiflexion	↑ 7 points for light touch only	↑ at follow-up	None	Fever, headache
5	44	650	Syrinx C3-T7	A, T7	50	T7 light touch only	At 3 mo, none	None	None	None	None
6	47	15	T11-12	A, T11	50	R and L,L1;0	At 1.5 and 6 mo, none	None	None	None	Febrile illness; antibiotic
7	26	48	C5-6	B, C6	30	R and L, C7;1	At 6 mo, none	None	None	None	None

AIS = American Spinal Injury Association Impairment Scale (A, B, C, D); ASIA = American Spinal Injury Association; C = cervical; T = thoracic; R = right; L = left.
a. British Medical Council for 5 upper (maximum = 50) and 5 lower (maximum = 50) key muscle groups.
b. Sensation for pinprick—side (right or left), cord levels, 0 = no appreciation; 1 = impaired; 2 = normal.

compatible with a practice effect. Chronic, burning upper back pain gradually diminished after surgery. S1 was able to reduce the daily dose of fentanyl from 100 ug to 50 ug at 3 months and discontinue fentanyl by 6 months. At 10 months, examination revealed no change in elbow movement and no sensorimotor or functional gains. Occasional bouts of dysautonomia were unchanged.

Subject 2. Subject 2 (S2), who had high tetraplegia and no motor function below C-3, received cells at the level of the cystic myelomalacia, as well as through 2 burr holes placed over the frontal lobes. S2 required assistive ventilation at inspiratory pressures of 12 mm Hg or greater before surgery. Spasms of the arms and legs diminished for the 1st 7 to 10 days after surgery but reappeared. The postoperative hospitalization was complicated by meningitis, delirium, pneumonia, and gastrointestinal bleeding, which required multiple medications for management. On returning from China, the family believed S2 was improving and decreased the ventilator inspiratory pressure to 8 mm Hg. Two days later, S2 was hospitalized for pneumonia and atelectasis. After S2 recovered, inspiratory pressures were again maintained at approximately 12 to 14 mm Hg. S2 believed that the strength of the neck and trapezius muscles above the level of the injury had improved in the months after surgery, during which he participated in a new daily program of physical therapy. The mother thought that S2 had improved to be able to extend an elbow, but the examination showed that elbow extension only occurred passively by gravity when the distal arm was held below the horizontal. Occasional bouts of dysautonomia were unchanged.

Subject 3. Subject 3 (S3) had an incomplete C-4 central cord injury; MRI revealed an area of myelomalacia from C-4 to C-5 involving approximately 75% of the diameter of the cord. With extensive practice during the 1st 2 years after SCI, S3 had taken assisted steps for up to 15 m within 20 min but had stopped training for almost 2 years prior to cellular implantation. For about 5 days after surgery in Beijing, S3 found that the chronic hypertonicity and spasms induced by attempted movements had diminished. The subject more easily rotated the left hand toward the mouth and slightly everted a foot. S3 had developed headache, fever, and confusion within the 1st postoperative day, which suggested meningitis, and then developed a drug rash to Cefobid. The drug was stopped and then in error restarted, leading to a severe maculopapular rash. Four months after returning from Beijing, S3 initially believed that daily stepping training was improving the ability to take steps, but S3 still required maximal assistance. Marked spastic paraparesis and trunk weakness persisted and neither selective movements or stepping differed from the preoperative assessment. S3 discontinued all standing and walking attempts about 6 months later and stated by telephone that function had not improved or worsened with the surgery.

Subject 4. Subject 4 (S4) had sustained an incomplete tetraplegic injury and recovered to independent ambulation using canes. S4 was continent but had bladder hyperactivity. S4 sought the implantation procedure in the hope that a reduction in severe lower extremity spasticity would ensue and improve functional ambulation. The MRI showed myelomalacia at C-6/7. One day after surgery, S4 thought that finger movements of the right hand had improved. S4 experienced a febrile reaction and headache for 2 days after surgery. In the United States, S4 exercised regularly with a physical therapist to try to improve walking. When a postsurgical gait analysis was compared to the presurgical video assessment, no clear change in kinematics and spatiotemporal features was found. A small improvement in light touch was noted. Severe leg spasticity persisted.

Subject 5. Subject 5 (S5) had sustained a complete T-7/8 thoracic injury 26 years before cellular implantation. MRI showed a large syrinx extending to C-3 that was clinically silent. S5 had previously participated in an experimental program of functional electrical stimulation for walking. S5 underwent implantation at the C-3/4 level and had headache and fever postoperatively. After surgery, the sensory level was unchanged and no functional changes had developed.

Subject 6. Subject 6 (S6) had a complete lesion at T-11. S6 developed headache and fever immediately after surgery and was placed on antibiotics. S6 reported that the big toes of both feet occasionally moved after surgery. Repeated clinical muscle testing and needle electromyography (EMG) recordings disclosed no difference between the preoperative and postoperative assessments, and an examination found no new voluntary muscle

activation, sensory change, or functional improvement after surgery, even with 6 months of postoperative rehabilitation. Hypertonicity was not a clinical problem for this subject before or after surgery.

Subject 7. Subject 7 (S7) had an incomplete ASIA B lesion at C6. No spasms were present before or after surgery. S7 reported that knee extensor muscle function could be elicited after surgery when stretching the abdominal muscles by lying backward. Both clinical muscle testing and EMG recordings, including tests taken in this position, revealed no changes. Motor-evoked potentials continued to be absent, and sensory-evoked potentials continued to be delayed.

Methodological Considerations Drawn from Case Reports

From the perspective of evidence-based medicine, this observational study cannot, of course, represent either the complete experience of Dr Huang's surgical group or the outcomes determined by a proper randomized controlled trial. The observations, however, point to problematic methodology and scientific issues in the Beijing reports that could be addressed in future trials of cellular transplantation for SCI.

No clear clinical or anatomical selection requirements for this surgical procedure, either inclusion or exclusion criteria, were apparent for this series of participants. Subjects who had incomplete SCI and retained functional movements below the lesion were eligible, along with those with a complete traumatic SCI. Although the presence of a focal region of myelomalacia permitting injection of implants into the caudal and rostral ends of the cavity had been indicated by Dr Huang in his publication and lectures as anatomical entry criterion, this criterion clearly was not the only criteria utilized. For example, S5 had cells placed at the rostral C-3 level of an asymptomatic syringomyelia, but the SCI had caused paraplegia at T-7. S2 had cells placed bilaterally into the frontal lobes of the brain.

Medical complications affected at least 5 of the 7 subjects evaluated. These adverse events included meningitis with headache that required antibiotics and repeated cerebrospinal fluid examinations, drug-induced rash, gastrointestinal hemorrhage, and pneumonia. Other common complications of spinal surgery from general anesthesia, dural leaks, and wound infections could not be ascertained from the information given to patients and families. Dr Guest observed in Beijing a case of wound breakdown, a case of meningitis after surgery, and a reduction in leg function in 1 of 12 subjects whom he and colleagues formally examined.

No comprehensive plan for preoperative and long-term postoperative assessments of impairments and disabilities by the Huang group was appreciated for the 7 subjects. Follow-up did not extend beyond the 1st 2 to 4 weeks after surgery. More objective assessments of impairments and disabilities before surgery, as well as routinely during the 1st year after surgery, are necessary to determine the short- or long-term risks and benefits of cellular implants followed by rehabilitation efforts.

Functional effectiveness of the implants was not evident in the 7 subjects, as only 1 objective change in impairment occurred. S4, who was graded ASIA D before surgery and walked over ground, developed a very slight change from twitch of the tibialis anterior muscle to partial ankle motion, but not against gravity, and a small dermatomal change in light touch. Symptomatically, S1 had less need for pain medications in the months after surgery to manage a focal area of posterior trunk dysesthesia several segments below the level of the lesion. Physiologic fluctuations that are common in patients with chronic SCI or some aspect of the procedure may account for these changes.

Publication from Dr Huang

Huang and colleagues reported in the *Chinese Medical Journal* on their transplantation of OECs into 171 subjects (114 with cervical lesions) with SCI. Ages ranged from 2 years to 64 years, with a mean of 35 years.[7] These subjects had traumatic injuries or epidural hematomas from 6 months to 18 years duration, with a residual focal cystic region of myelomalacia. No information about preoperative ASIA measures and stability of neurologic impairments and functional disabilities was provided. The article states that before implementation, subjects had received neurotrophic factor, nerve growth factor, or spinal cord decompression. No details were provided about the origin of the growth factors, timing of administration, dose, effects, or complications. The report states that 500 000 cultured fetal cells from the "glomerular layer of the olfactory bulb" were implanted after

laminectomy into the rostral and caudal ends of the cyst. Higher scores on the ASIA scales of motor, light touch, and pinprick impairment, regardless of age, were found by 2 to 8 weeks after surgery. The motor scores of the patients from age 20 to 50 years changed by a mean of 8 ± 8 points, and only these mean changes were listed. Interrater reliability for this measurement was not described, and the assessors were aware that surgery had taken place. Disability-related outcomes or information about autonomic and bladder function were not reported. It has to be concluded that widely accepted clinical trial protocols were not utilized to define subject eligibility and to objectively assess any complications and changes in disability.[9,10]

Oral Reports from Dr Huang

In February 2004, Dr Huang lectured to a meeting of a consortium of national research and advocacy groups called the International Campaign for Cures of Spinal Cord Injury Paralysis (ICCP) in Vancouver.[10] He reported that each subject received olfactory bulb cells obtained from 2 aborted fetuses at 14 to 16 weeks gestation. No blood type or tissue matching between the fetuses and the patients was performed. After the cells were grown in tissue culture, they were injected into the rostral and caudal ends of the region of myelomalacia as defined by MRI. Dr Huang reported no adverse reactions in more than 500 implantations. He showed brief video clips of 5 patients whom he believed had made very modest improvements within several days after surgery. Dr Huang was not able to explain a mechanism by which the transplants would have had such a rapid benefit. Two subjects improved by day 2 after injection. Before surgery, they were tested supine and attempted to flex the elbow by dragging the arm over their chest. After surgery, they were seated with the arm supported by an examiner and appeared able to partially flex against gravity. Another subject had marked hypertonicity and clonus and stood with 2 helpers. Two days after surgery, stiffness appeared reduced and the subject took several assisted steps with 2 helpers. Because of the manner in which preoperative and postoperative assessments differed, any interpretation of the degree or sort of improvement was difficult to interpret.

Other Observational and Media Reports

Regarding medical complications, Dr Huang said, "No problems with the cells; maybe we have complications of the surgery—infection of the area, leakage of the cerebrospinal fluid. The general complications of other surgery."[11] Dr Guest observed Dr Huang while Dr Huang performed a standard surgical exposure of the spinal cord and injected cells using a tuberculin syringe, a pediatric needle, and IV tubing in 4 patients and commented that the surgical technique and anesthetic administration were of high quality. As noted, however, he observed a variety of perioperative complications. In addition, he found that high dose methylprednisolone was administered to some subjects at the time of surgery. The use of this drug is controversial and has been linked to medical complications.[12] Dr Wise Young told the *Detroit Free Press* that he believed that as many as 3 SCI and 10 ALS recipients may have died from the procedure.[13] This information needs verification to gauge the real risk of mortality. Open reporting of medical complications is feasible for physicians in the People's Republic of China, where morbidity and mortality have been published by other Chinese physicians for medical and surgical interventions.[14,15]

The nature of the implanted cells is unclear in the publication and verbal reports of Huang and colleagues. In a *Technology Review* article,[11] Dr Huang said, "We get the olfactory bulb out. Of course, mixture. Then we culture them and purify them . . . 90 percent olfactory ensheathing cells (OECs)." The observational data obtained in regard to the transplant material are more complex. Guest and others recently published the results of immunostaining 2 cell cultures provided by Dr Huang.[16] The cells appeared viable and were positive for the markers nestin and GFAP but negative for S-100. These cells were not clearly OECs but appeared to be astrocytes and immature cells. Dr Guest was not permitted to visit the cell culture facility in Beijing to verify the cell preparation procedures. Details of the cell preparation have never been released.

Concerns about the type of cell implanted have also been raised at meetings in which Dr Huang has presented his videotapes. Identification of small structures such as olfactory bulbs in fetal tissue specimens obtained from early therapeutic

abortions is considered difficult, and the earliest developmental age at which the human olfactory bulb becomes populated by OECs is uncertain. The outer glomerular layer that Huang and others[7] have reported as their source of cells has not been shown to be a source of fetal OECs and contains many cell types, most commonly astrocytes. Furthermore, the fetal olfactory bulb almost certainly contains cells with progenitor capacity. Thus, in the absence of compelling evidence, the cells transplanted in Beijing should be identified as human fetal cells, possibly of olfactory bulb origin.

The nature of the implanted cells is a critical issue for future transplantation investigations. Dr Huang has drawn on the limited success of injecting adult-derived OECs into animal models of SCI.[17,18] No published reports of fetal OECs, however, have claimed to improve outcomes in experimental animal models of SCI. The only report of the use of purified fetal OECs in spinal cord contusion indicated that the cells did not associate with axons.[19] Also, no animal studies have been reported in which OECs were injected into the brain to address the problem of SCI. Autologous adult OECs have been injected into the spinal cord of human subjects in a safety trial.[20]

Entry criteria and the clinical goal for the procedure were unclear in the 7 cases and in observations by Dr Guest. Other patients have been implanted for diseases such as transverse myelitis, despite prior surgical interventions such as omental transplants to the cord, as well as for symptoms of pain, spasticity, or a self-selected subjective goal.

SOLUTIONS

Understanding Anecdotal Success

A few alternative explanations may account for the very modest changes occasionally observed or perceived by recipients. Immediate postoperative hypotonicity was apparent in 4 of the subjects in this report, all of whom had a history of symptomatic spasticity. A decrease in clonus and spasms was also evident in some of Dr Huang's videos and was mentioned in several media reports. Manipulation of the spinal cord by laminectomy, incision of the dura mater, and injections of cells, as well as induction of an immunologic response or aseptic meningitis or both, could have altered perioperative spasticity. Hypertonicity returned within 10 days after surgery in all subjects. Any changes in movement are not expected to outlast the return of hypertonicity. Of interest, Reier[21] also reported less spasticity and excitability shortly after spinal implant surgery or after filling a syrinx with embryonic tissue.

After leaving China, some patients may have achieved gains from participating in rehabilitation therapies. All 7 subjects studied before and after surgery had not had recent preoperative physical therapy but worked daily with therapists and their families after returning from Beijing. Progressive practice is a cornerstone of rehabilitation and physiologic neuroplasticity. Modest gains commonly evolve, regardless of the duration of a brain injury or SCI, in patients who retain some level of motor control.[22,23]

Psychologic and cultural factors always play an important role in the perception of the benefits of a new approach for patients with chronic neurologic diseases. Randomized trials with a control intervention explicitly try to limit this effect. Patients often express frustration by their perception that experimental therapies available outside of their country are prohibited in their country because of overly cautious regulatory agencies or the use of aborted fetal tissue and stem cells.[6] A strong personal belief in the expected benefits of the intervention and the influence of a physician and an environment that expects improvement may bias postoperative personal perceptions. That international patients pay at least $20 000 for the implant procedure[6] may both confirm and bias their assessment of the strategy. One of the families among the 7 case studies raised $50 000 for the procedure, their own nurse, and travel expenses. This financial stake in the outcome may also bias patient satisfaction, in that any potential opportunity to get better is worth purchasing, regardless of the final result.

Reaching Out to Patients and Practitioners

The procedures in Beijing do not meet the basic qualifications of a controlled experiment by currently accepted international standards. As performed, no scientific or clinical questions about transplantation for chronic SCI have been addressed. The academic community, patient advocacy groups, and the media must help encourage the utilization of internationally devel-

oped standards when new biologic interventions are introduced.

Academic Medicine

The neuroscience, medical, biomedical, and rehabilitation community must take on greater responsibility for airing problematic applications for the translation of basic research. Caution and courtesy are important, considering the dedication and resources invested in controversial interventions, but should not interfere with frank discussion and critical analysis when major methodological issues become manifest. The academic community should continue to emphasize that complex human experiments in neural repair for severely disabled patients must be proven safe and effective by the highest standards of scientific inquiry.[20] Alternative methodological and ethical opinions should be openly discussed to assess their validity and utility. Dr Huang was reported as saying that a placebo or sham surgery would be unethical.[24] "Even if it was [legal]," he said, "I wouldn't do it. Double-blind trials only harm the patient." In contrast to Dr Huang's opinion, placebo-controlled randomized trials conducted in China have been reported in prestigious Western journals.[25] Indeed, current guidelines for clinical trials, such as the International Conference on Harmonisation Tripartite Guidelines,[26,27] or specifically for SCI[9,28] should be incorporated into every experiment with human subjects. The worldwide research and clinical community must help disabled persons and their advocates understand the fundamental value of guidelines and peer review and how these safeguards protect the welfare of patients.

Advocacy Groups

Groups that represent the neuroscience community of clinical and basic researchers, as well as nonprofit groups that fund and educate patients with SCI and other neurologic diseases, must continue to find ways to better inform and counsel patients and families who seek controversial therapies. Advocacy groups can make it clear that participation in invasive surgical interventions for SCI may disallow their participation in any future clinical trial of a biologic therapy. Clinicians and nonprofits should offer a logical counterpoint to the nonskeptical enthusiasm often found on Web sites and Internet chat rooms by explaining why the methods, such as those being used in Beijing, fail scientifically and ethically. It may be counterproductive, however, to condemn an intervention or aggressively discourage patients without inviting discourse. The immediate allure of a new intervention such as cellular transplantation for a disabling condition requires objective, arms-length counseling about the specific details of the risks and likely benefits of a procedure. If the procedure is not conducted by a methodology that meets validated international standards to determine its safety and efficacy, participation should be strongly discouraged.

Media

Newspaper, Web-based, and television reports about new research findings and interventions for diseases can have a profound effect on patients who are seeking a cure. Testimonials played by Western media have had an important role in bringing Dr Huang's experiment to patients with SCI.[11] The media must strive to look critically at uncorroborated or overreaching reports. For example, media outlets and prestigious scientific journals including *Science* and *Nature* have repeatedly stated that Dr Huang is transplanting OECs, despite the lack of objective data to validate this claim.[24] An emphasis on subtle and transient sensorimotor changes such as a toe that wiggles, rather than functionally beneficial gains, fill these stories.[24,29,30] Too often, inspiring phrases such as "China leads the world in the fetal stem cell transplant field" and "pioneering medical procedures" bias stories about patients who have traveled to China for treatment.[24] For example, a CBS News report on July 27, 2004, on the use of implants in Beijing for ALS and SCI included the troublesome and unsubstantiated remark, "American neurological experts say this is good science."[29] In covering the translation of scientific research into medicine, reporters could address concerns as to whether international standards for the protection of human subjects, which includes the proper use of patients to determine the safety and efficacy of a new drug or biological procedure, are being met.

CONCLUSION

Based on the observations in this series of 7 subjects, the safety and efficacy of Dr Huang's implan-

tation procedure are unclear. Patients have encountered serious medical complications and no lasting increase in sensorimotor function or functional ability.

Controversial medical interventions may seem to be a reasonable risk for people living with serious disability from SCI and a way to overcome the limited expectations they perceive within their medical systems. Some patients find value in the atmosphere of hope that is inherent in new approaches offered by a confident practitioner. Positive nurturing, however, is not outweighed by potential risk without benefit from an unsubstantiated clinical practice. The Beijing program's methodology has prevented the determination of safety and efficacy for this cell-based approach. Until international standards for scientific trial methodologies have been incorporated, clinicians are obligated to advise their patients to forgo Dr Huang's procedure.

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