Additional Table 2 Clinical application of cells for the treatment of SCI (published data).

Type of cells	Source/ location of tissue	Procedure	No Pts & SCI Stage	Outcome	References
OECs	OM	1. OECs were obtained from OM of the septum. 2. The cells were cultured for three weeks with mainly OECs. 3. Injections were planned proximally and distally to the lesion epicenter. Parameters for cell micro injection were as follows: volume of single injection 0.5 μL, cell concentration from 30,000–200,000 cells/μL.	6 Complete chronic thoracic SCI (6 months to 5 years post-injury)	Clinical Trial Phase I: Modest improvements in neurological function occurred against a background of intense neurorehabilitation.	Tabakow et al., 2013
OECs	OM	1. OM biopsies were taken and the cells were cultured for four weeks, 2. 2 mL OECs suspensions were injected into the dura into the area around the caudal border of the SCI lesion under magnetic resonance imaging (MRI) guidance, twice a week for 4 weeks. Each puncture site was sealed and covered with Tegaderm for 24 hours.	8 Chronic cervical SCI (> 6 months post-injury)	Pilot Clinical Study: Even though significant improvements were seen 3 months after treatment, significant improvements are not reported after 1 year follow up. Bladder function was restored in two patients. Overall no serious complications are noted.	Rao et al., 2013
OECs	OM	1. OECs were obtained after isolating the lamina propriae from the nasal biopsies. After 4 week of cell culture, OECs were re-suspended in 80,000 cells/μL mediums for the transplantation. 2. 1.1 μL injected at each injection site at four depths, adjacent and into the lesion. Patients received different numbers of cells (12–28 millions).	3 Complete chronic thoracic SCI (6 months to 3 years post-injury)	Clinical Trial Phase I/IIa: Three year after cell implantation, there were no medical, surgical or other complications to indicate that the procedure is unsafe.	Féron et al., 2005; Mackay-Sim et al., 2008
OECs	OM	1. Transnasal endoscopic OM grafting was done. scar tissue was removed. 2. OM with autografts transplantation to lesions of 1–6 cm at C_4–T_6 levels.	7 Chronic cervical or thoracic SCI (> 6 months post-injury)	Pilot Clinical Study: 2 patients reported return of sensation in their bladders, and 1 of these patients regained voluntary contraction of anal sphincter. 2/7 American Spinal Injury Association (ASIA) A patients became ASIA C. Improvement demonstrated in ASIA motor scores for all patients. All except for 1 patient showed improved ASIA sensory neurological scores. Adverse events included sensory decrease in one patient.	Lima et al., 2006
OECs	OM	1. OECs were derived from the olfactory bulb and then after being cultured for 2–3 weeks, a density of 10,000 cells/μL got prepared for the transplantation. 2. 50 μL of cultured OECs injection into the spinal cord adjacent to rostral and caudal ends of the lesions.	171 Chronic SCI (6 months to 18 years post-injury)	Results were compared between 5 different age groups and demonstrated that OECs transplantation improves the spinal cord functions regardless of the age.	Huang et al., 2003b
SCs	Sural nerve	1. Sural nerve ligation in one lower extremity was performed 1 week before the operation in order to activate the SCs. 2. the Sural nerve were isolated and Durotomy was performed to expose the spine, 3. 200 μL of SCs suspension with cell concentration was 20,000–30,000/μL) was injected into the adjacent area of the injured site with a micro-injector.	6 Acute to chronic SCI (1 week to 20 months post-injury)	Clinical Trial Phase I: After more than 5 years of follow-up all tests suggested that SCs transplantation combined with neurorehabilitation schemes may be feasible, safe and effective to promote neurorestoration to SCI patients.	Zhou et al., 2012
SCs	Sural nerve	1. The proximal 15 cm of sural nerve in the upper calf was used as the main harvest portion for autologous tissue culture to isolate SCs. 10,000 cells/μL were used for transplantation. 2. 5-cm incision, paravertebral muscle dissection, laminectomy and 3-cm durotomy were performed,	33 Chronic cervical or thoracic SCI (> 2 years post-injury)	Clinical Trial Phase I: There was no case of permanent neurological worsening or any infectious or viral complications after two years. No new increment in syrinx size or abnormal tissue and/ or tumor formation were observed on contrast-enhanced magnetic resonance imaging (MRI) studies performed 2 years after the treatment.	Saberi et al., 2011
Immunomodulatory cells	Peripheral blood	Peripheral blood and autologous skin were harvested. Isolated monocytes were incubated. Six 20 μL injections, each containing 250,000 autologous incubated macrophages (total dose of 150,000 cells in 120 μL), were performed with a single hand-held syringe at the caudal boundary of the spinal cord contusion.	43 Complete acute cervical or thoracic SCI (< 2 weeks post-injury)	Clinical Trial Phase II: The analysis failed to show a significant difference in primary outcome between the controls and the treated group. The study results do not support treatment of acute complete SCI with autologous incubated macrophage therapy as specified in this protocol.	Lammertse et al., 2012
Mesenchymal stem cells (MSCs)	BM	60 mL BM were aseptically aspirated from the iliac crest under local anaesthesia. MSC suspensions (10 million cells/mL) in saline solution containing 20% human serum albumin were transferred into 1 mL syringes for local injection in subjects. A fixed cell number (5 million cells/cm3) was injected per lesion volume based on MRI analysis.	14 Complete chronic thoracic or lumbar SCI (> 6 months post-injury)	Clinical Trial Phase I: Overall, the present study demonstrated the safety, feasibility and potential efficacy of autologous MSC administration into subjects with chronic SCI, even though the study is non-randomized and uncontrolled.	Mendonça et al., 2014
MSCs	BM	90 mL BM were aseptically aspirated from unilateral or bilateral posterior iliac spine. Aliquots of 25 μL concentrated cell suspensions (800,000 cells/μL) were prepared, The 25 μL prepared aliquots of the cell suspension was injected to a depth of 3 mm at multiple sites in the central dorsal area across the junction of injured and normal spinal cord.	40 Complete chronic cervical SCI (> 6 months post-injury)	Clinical Trial Phase I: Contrary to the controls that showed no improvements, ten treated patients (50%) showed clinical improvement. Among these, one patient had improvement in motor function alone, two had both motor and sensory improvement, one had improvement in sensory and urinary function and six patients had improvement in both motor, sensory and bladder functions. No sign of tumor was evident until 6 months postoperatively, indicating the safety and potential efficiency of such treatment.	Dai et al., 2013
MSCs	BM	1. 20 mL BM were aseptically aspirated from the iliac crest. (700,000 up to 1.2 million of BM MSCs in the suspension). Quality controls of the cells were done before transplantation. 2. The prepared cell suspension was injected into CSF *via* lumbar region at L_{3-4} level by lumbar puncture.	11 Complete acute and sub-acute thoracic SCI (< 2 weeks or 2–8 weeks post-injury)	Clinical Trial Phase I/II: Five patients out of 11 (45.5%) in the study group and three patients in the control group (15%) showed marked recovery, but the results were not statistically significant. Overall, the transplantation of autologous BM MSCs *via* lumbar puncture is a feasible and safe technique, but at the moment, no clear answer can be given regarding the clinical potentials.	Karamouzian et al., 2012
MSCs	Adipose tissue	1. Human adipose tissues were obtained *via* a simple liposuction from the abdominal subcutaneous fats. 2. four 100-mL normal saline containing 100 million cells/each were prepared and a total of 400 million autologous hAdMSCs per patient was introduced into the cephalic vein over 3 to 4 hours.	8 Chronic SCI (> 12 months post-injury)	Clinical Trial Phase I: No serious adverse events were reported after the cells transplantation during the 3-months follow-up at the time of writing. In the current clinical trial, 1 patient out of 4 with ASIA grade A showed improvement to ASIA grade C. Motor score improvement was shown in 3 patients.	Ra et al., 2011
MSCs	BM	1. 60 mL BM were aseptically aspirated from the iliac crest under deep sedation. 2. Two groups of patients (one < 6 months post-SCI and one > 6 months post-SCI) were were defined and all patients received 2–3 injections, 1 week apart at a dose of 1 million cells/kg body weight *via* a lumbar puncture.	30 Complete sub-acute or chorinic cervical or thoracic SCI (1 to 6 months or > 6 months post-injury)	Clinical Trial Phase I: No adverse events were reported after the BM MSCs transplantation but due to the limited number of patients and the uncontrolled nature of the trial the results were not conclusive.	Pal et al., 2009
MSCs	BM	1. A 600/cm^3 BM MNCs sample was obtained *via* needle aspiration of the iliac crest BM; then an MSCs culture followed for 4–6 weeks. 2. Three groups were created; the 1st was co-incubated with unselected MNCs from the patient (control), the 2nd was co-incubated with the $CD3^+$ $CD25^-$ patient's lymphocytes and the third with the $CD3^+$ $CD25^+$ patient's lymphocytes to be transdifferentiated into neural stem cells (NSCs). 3. NSCs were infused *via* a feeding artery of the lesion site.	2 Chronic cervical or thoracic SCI (> 6 months post-injury)	Preliminary results demonstrated that this method has minor adverse effects and can be effective for the repair of chronic SCI. Both patients demonstrated significant motor and sensory improvements without any adverse events.	Moviglia et al., 2006

SCI: Spinal cord injury; BM: Bone marrow; No Pts: number of patients; OM: olfactory mucosa; OECs: olfactory ensheathing cells; SCs: Schwann cells; CSF: cerebro-spinal fluid; hAdMSCs: human adipose tissue-derived MSCs.