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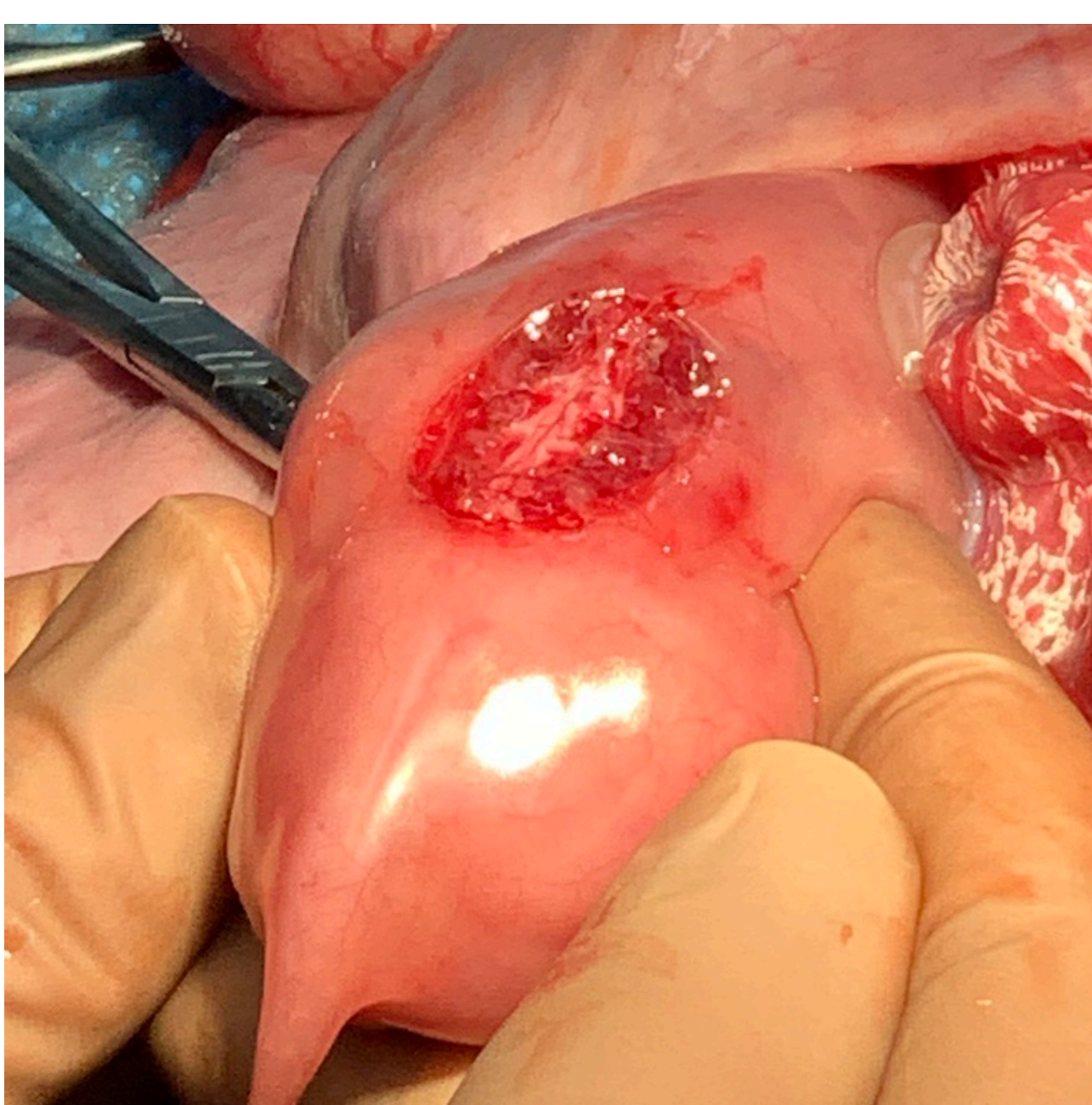
Therapy for in utero repair of the ovine fetal myelomeningocele model with patented human umbilical cord mesenchymal cells: proof of principle

Objective: There is an increasing evidence from animal models that local application of stem cells, in particular Mesenchymal Stromal Cells (MSC), combined with a prenatal repair of myelomeningocele (MMC) preserves spinal cord function. The objective of this study was to determine whether the administration of a patented human MSC product during in utero repair of MMC is feasible in an ovine model.

Methods: MMC defects (L1-L5) were surgically created at 75 days of gestation and repaired 25 days later in 8 fetal lambs. The lambs were randomly chosen for prenatal repair with or without local MSC application. A ready-to-use MSC product based on a patented isolation protocol utilizing umbilical cord tissue from healthy human newborns at high quantity and GMP quality was administered. In four fetal lambs 1 mL Desacell[®] gel suspension (30 Mio stem cells) was applied directly to neural placode. All fetuses received a watertight dural myofascial patch and skin closure.

Results: Three lambs were delivered at 145 days; five experimental lambs did not survive to term. Motor function was evaluated by the sheep locomotor rating scale. After 48 h of observation all lambs were sacrificed and the area of the MMC defect was removed “en bloc”. Cross-sectional areas of spinal cord were analyzed. The mean large neurons density was 15.3 per mm² of gray matter.

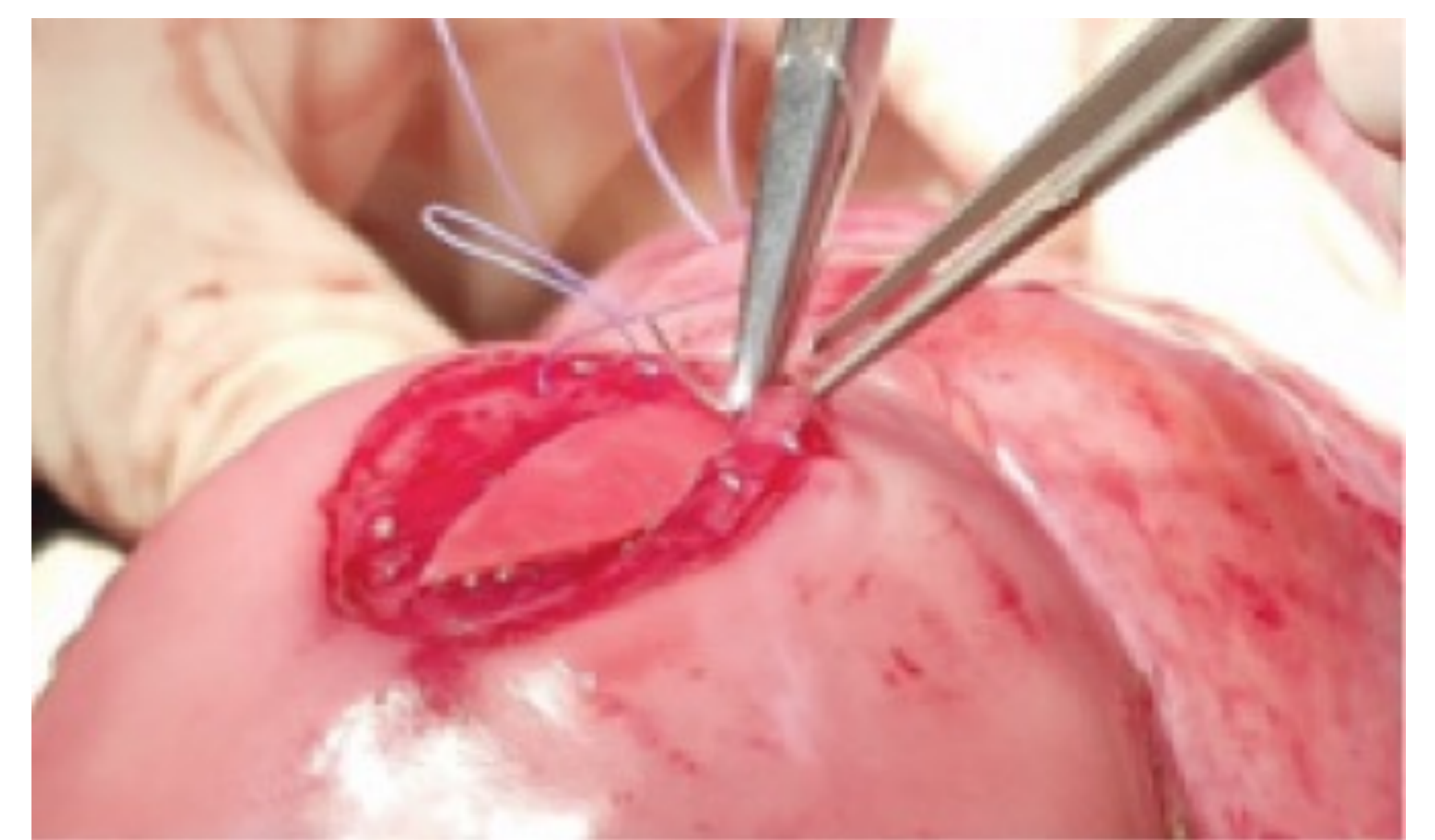
Conclusions: To our knowledge this is the first time that MSC obtained from human umbilical cord tissue were applied locally during the course of in utero MMC repair in an ovine model. The administration of MSC was feasible in all intended cases (n=4). Owing to low caseload a comparison of both groups in terms of motor function and neuronal preservation was impossible.



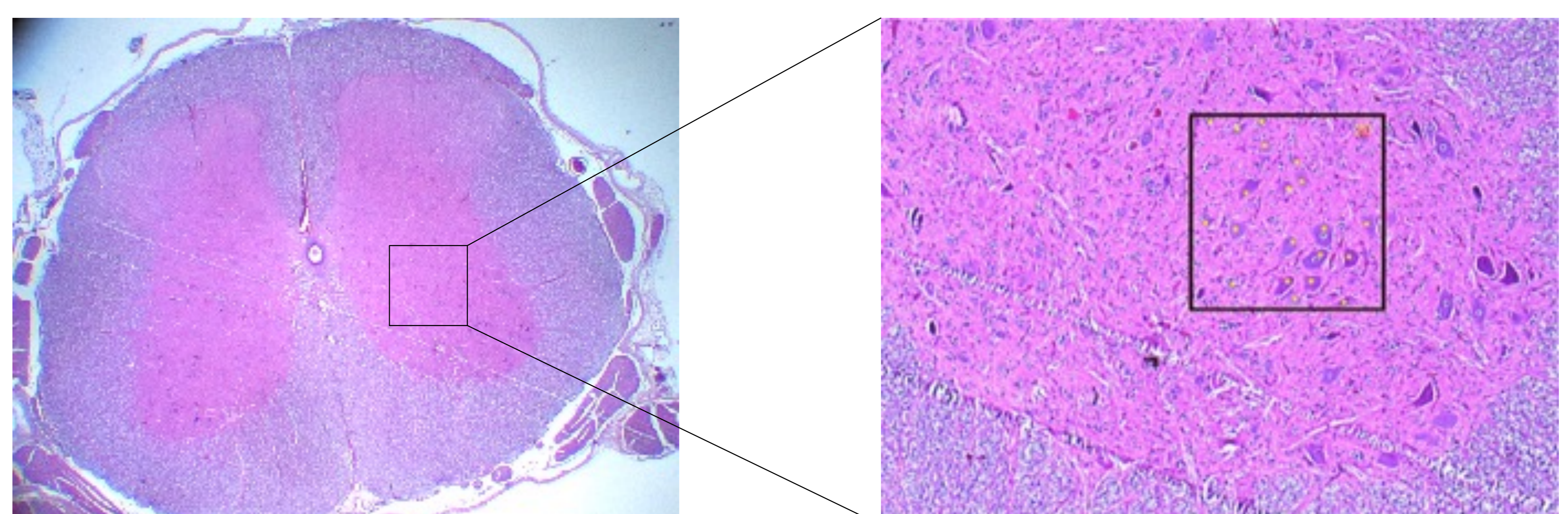
MMC defect creation at 75 days of gestation



Photographs of the prenatal local MSC application of 30 Mio stem cells (left image) following repair of the MMC using a patch (right image) at 100 days of gestation



Standardized sheep locomotor rating scale



Cross-section of the spinal cord (left image) and histological analysis of the large neurons density (right image)