Restorative Neurology
Summary and Closing Remarks

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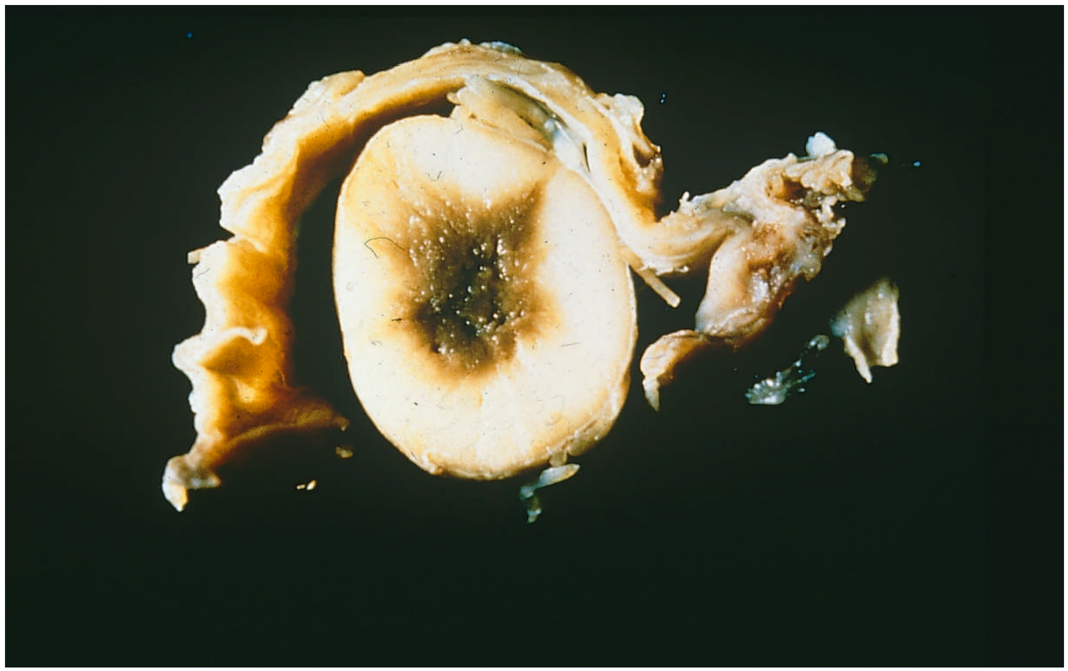

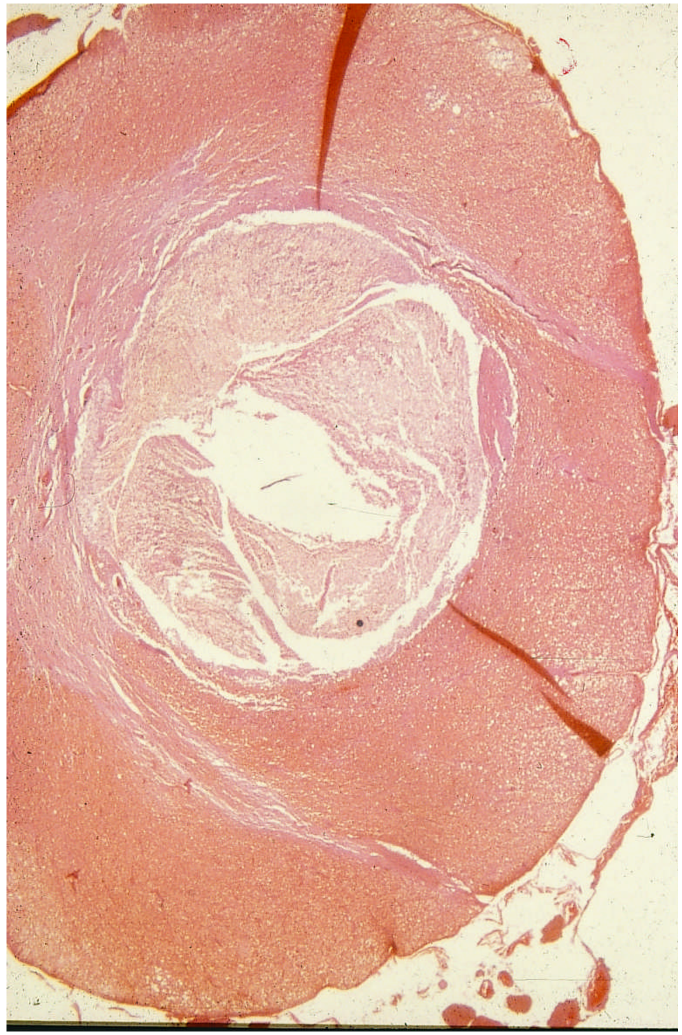

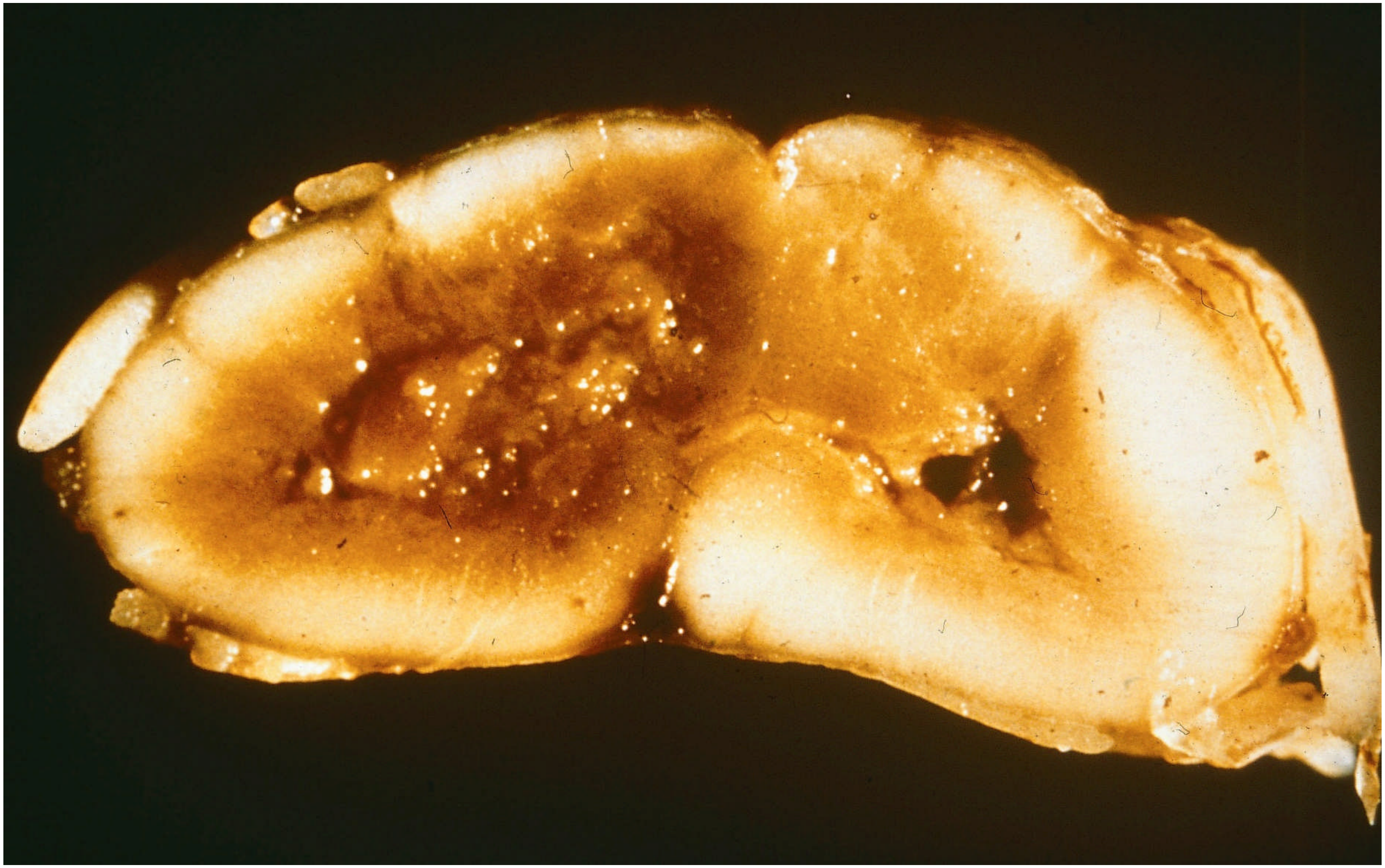

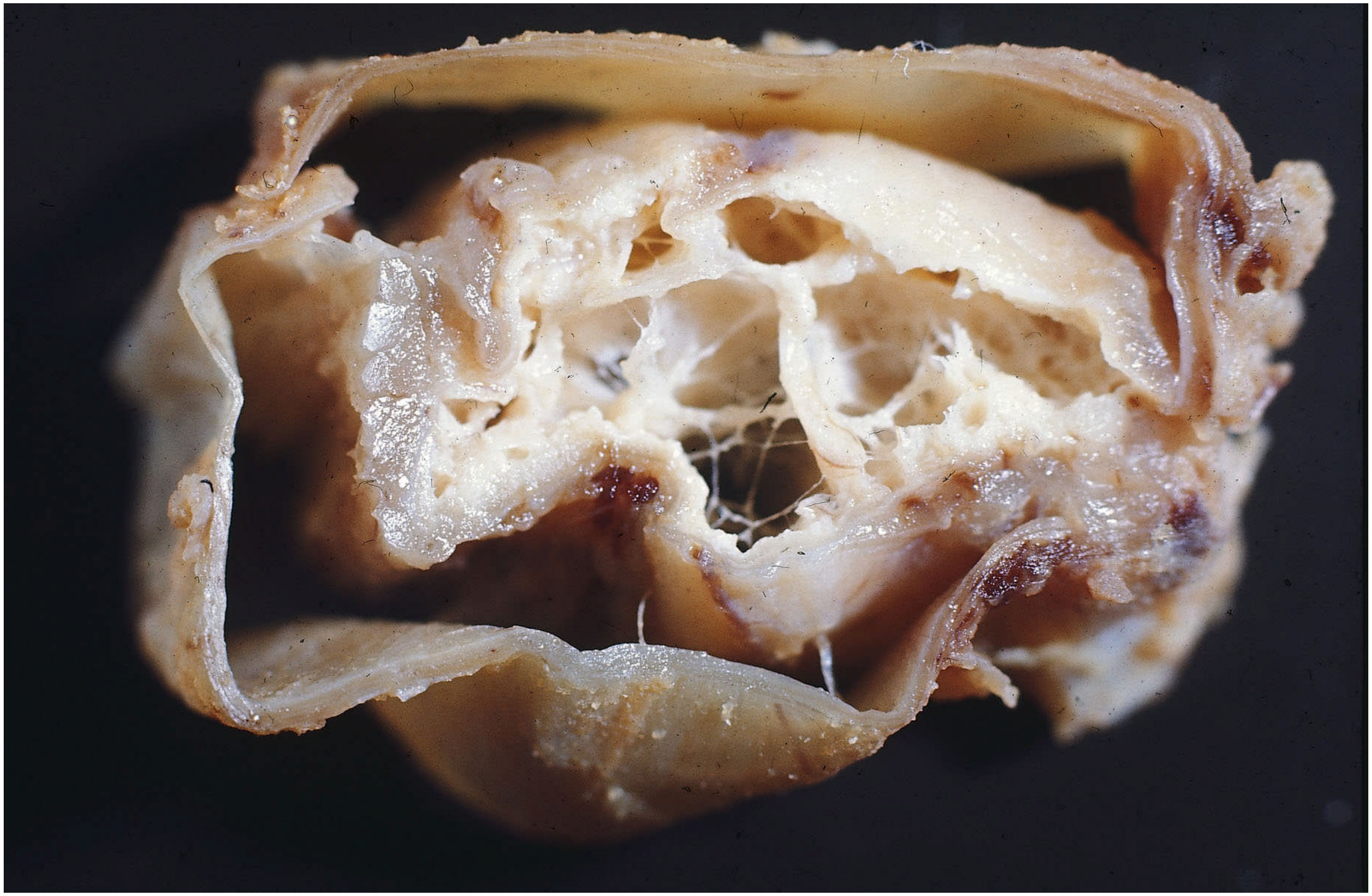

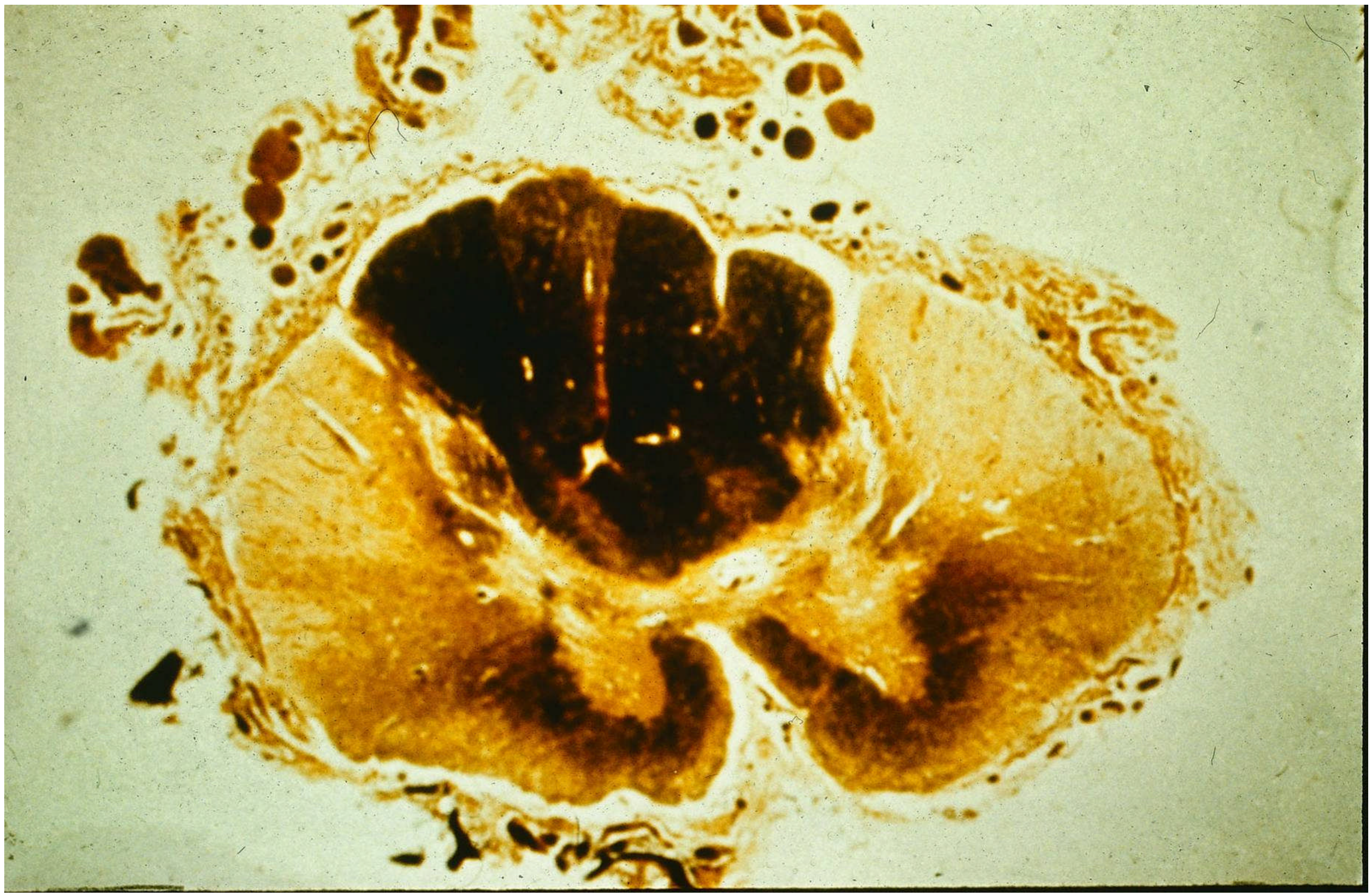

SCI Case Data

SCI Type	Acute	Chronic	Total
Complete	16	23	39
Incomplete	20	24	44
Discomplete	23	30	53
Unknown	69	15	84
Total	128	92	220

Mean Area of Residual Tissue Element (mm^2) in Complete SCI

	Total	Cavity	Wh Mtr	Gr Mtr	Con Tis	NR Reg	Gliosis
A61-86	39.03	0	0	0	5.20	0	33.83
A67-419	12.14	0	0	0	0	5.34	6.80
X72-115	39.87	0	0	0	39.87	0	0
A83-161	59.00	0	0	0	46.49	12.46	0
X84-105	30.67	0	0	0	0	1.78	0
X85-354	33.58	0	0	0	0	9.75	23.84
X85-710	21.35	0	0	0	9.29	0	11.66
A88-98	28.86	0	0	0	28.86	0	0

Mean Area of Residual Tissue Element (mm^2) in Incomplete SCI

	Total	Cavity	Wh Mtr	Gr Mtr	Con Tis	NR Reg	Gliosis
B62-4295	29.18	8.68	9.68	0	0	0	10.82
A67-542	21.67	0	6.54	2.27	0	0	12.83
A69-109	25.45	1.51	8.07	0	0	0	15.85
A80-2177	34.41	0	13.89	0	0	4.70	15.80
A18-202	24.59	6.47	9.62	0	0	0	8.83
A88-62	54.65	9.40	1.17	0	6.20	2.86	24.08
A65-390	40.71	10.94	5.61	0	0	0	25.17
N69-14	27.15	11.94	1.94	0	0	0.87	12.62
A70-462	22.51	3.97	3.17	0	0	0	15.38
A90-64	27.04	0	1.73	0	15.16	10.51	0

Main Area of Residual Tissue Elements (mm^2) in Discomplete SCI

	Total	Cavity	Wh Mtr	Gr Mtr	Con Tis	NR Reg	Gliosis
B65-2959	47.34	10.57	1.12	0	35.71	0	0
X80-58	14.19	0	3.89	1.18	0	0	9.12
X87-921	13.03	0	1.09	0	0	0	10.04

Preserved Fibres in the Lateral Pyramidal Tracts

	Left	Right	
Normal controls (T4)			
X88-794	44148	49021	Mean 41473
X89-308	42675	50259	
X89-483	28287	34447	
Complete SCI (T4) – Below the lesion			
A83/161	3742	4138	
A83/86	2261	2075	Highest 4138
X85-354	1084	770	
A88-98	1426	1408	
Incomplete SCI (T4) - Below the lesion			
A67-542	2852	4166	
A80-202	5288	-	Lowest 2151
A88-62	2151	3173	

It is evident from the results that the degree of retention of volitional motor control was not directly proportional to the number of preserved fibres. This would suggest that position and quality of residual fibres has an important role in retention of post-traumatic function

Preserved Fibres in the Posterior Columns

Normal controls (C4)		
X88-681	360047	
X88-794	439782	Mean 452480
X89-308	642169	
X89-483	367821	
Complete SCI (C4) – Above the lesion		
X72-115	216299	
X84-105	132034	Highest 216299
A88-98	147660	
Incomplete SCI (C4) - Above the lesion		
A67-542	307185	
A70-462	117359	Lowest 117359
A80-177	225491	
A90-64	143055	

The number of preserved fibres did not correlate with the amount of preserved sensation. In one incomplete case (A70-462), the number of fibres was less than the smallest of the complete cases. This could indicate that posterior column sensory neurones can travel via other regions of the spinal cord or confirm the earlier finding that quality of fibres is more important than quantity.

Methods of Restorative Neurology

- Pharmacological
- Physical
- Electrical
- Surgical
- Other

- **Experimental**
  - **Central Axonal Regeneration**
    - **Scar tissue removal**
    - **Identification and neutralization of inhibitory factors**
    - **Oligodendrocytes and MAG**
    - **Neurotrophins**
    - **Genetically engineered fibroblasts & Schwann cells**
    - **DNA manipulation transgenes & expression of primitive genes**
  - **Fetal Grafts**
  - **Peripheral Nerve Grafts**
  - **Schwann Cell / OEC bridge / Rolipram**
  - **Stem Cells**

Clinical Neurology and Neurosurgery

Dimitrijevic : Basic characteristics of NS posture and locomotion

- Rothwell : parallel processing, works as a whole, plasticity , robust design
- Tansey et al: “new anatomy "recreate CNS or implement interventions
- Dimitrijevic et al: clinical assessment of residual functions
- McKay : BMCA validation
- Zidar, Bivovicar: movement related cortical potentials in ALS
- Stroman : CNS imaging in RN axonal integrity
- Brown ,Deriso: CNS trauma reconstructive options
- Galea : biophysical modalities to optimize recovery
- Pape : unmasking apraxic revealing latent functions
- Minassian et al neuromodulation as an RN tool, FES,
- epidural stimulation activation of latent circuits
- Brown ,Deriso: CNS trauma reconstructive options
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- Pape : unmasking apraxic revealing latent functions
- Minassian et al neuromodulation as an RN tool, FES,
- epidural stimulation activation of latent circuits
- Tang : botulinum and spasticity
- Kauffmann: decompression of ischemic apraxia for diaphragm

FUTURE DIRECTIONS

- Application of advances in neurophysiology and neurobiology to RN
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- Physical: including electrical and magnetic stimulation enhancing plasticity
- Surgical ; transplantation reconstruction
- Pharmacological: new drugs, receptors, trophic factors
- Biological : regeneration , grafts, stem cells
- Genetic ; DNA activation of survival genes, new genes
- Neurophysiological modulation, re-education

- CONCLUSIONS

- Incorporation of RN principles into conventional neurorehabilitation
- Stroke trauma degenerations