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WHITE AND RED PULP RATIO AS A MORPHOMETRIC CRITERION OF SPLENIC CHANGES IN EXPERIMENTAL RENAL FAILURE

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Background. Descriptive histological reports of the spleen in renal failure are numerous, yet they rarely convert observation into a reproducible number. The relative areas of white and red pulp are the two compartments that respond in opposite directions to the same insult, which makes their ratio an attractive single-value index of splenic remodelling. Whether this ratio behaves consistently enough across age groups to serve as a formal morphometric criterion has not been tested.

Objective. To determine the age-related trajectory of the white-to-red pulp ratio in intact rats, to quantify its deviation under chemotherapy-induced renal failure, and to test whether the ratio is sensitive enough to register the effect of dandelion root biocorrection.

Materials and Methods. Two hundred and ten male outbred rats aged 3, 9 and 12 months were allocated to intact, experimental and correction groups. Cutaneous carcinogenesis was induced with 7,12-dimethylbenz[a]anthracene, after which a single intravenous dose of cisplatin (3.0 mg/kg) was administered; renal failure was verified biochemically (urea 45.22–108.98 mg/dL, creatinine 1.41–3.78 mg/dL, cystatin C 1.22–3.18 mg/L versus physiological values in intact animals). Correction animals received an aqueous infusion of Taraxacum officinale root (2.0 ml/kg) for five days. Paraffin sections stained with haematoxylin-eosin were analysed in QuPath 0.5.1; relative areas of white and red pulp were expressed as percentages of the total section area, and the W/R ratio was calculated for every animal. Differences were tested with Student's t-test and the Mann-Whitney U-test at $p<0.05$.

Results. In intact animals the white pulp area declined progressively with age — 30.6±0.69%, 26.77±0.78% and 21.68±0.76% at 3, 9 and 12 months — while red pulp rose from 69.4±2.1% to 73.25±1.89% and 78.31±2.06%. The corresponding W/R ratios were 0.44, 0.37 and 0.28, describing a smooth physiological drift rather than an abrupt change.

Renal failure displaced this trajectory downward at every age. White pulp fell to 21.5±0.8%, 19.8±0.9% and 17.2±1.1% and red pulp expanded to 78.5±1.2%, 80.2±1.4% and 82.8±1.6%, yielding W/R ratios of 0.27, 0.25 and 0.21. The most informative observation is comparative: the ratio recorded in 3-month-old diseased animals (0.27) was already lower than that of intact 12-month-old animals (0.28). In other words, a single course of cisplatin-induced renal failure shifted the young spleen past the compartmental profile of natural senescence, an effect we designate as premature compartmental inversion.

Biocorrection returned the ratio toward the age-matched norm in every group: 0.39 at 3 months, 0.31 at 9 months and 0.26 at 12 months, corresponding to white pulp areas of 27.84±0.42%, 23.78±0.41% and 20.94±0.36%. Expressed as the proportion of the white pulp deficit recovered, this

amounted to 69.7%, 57.1% and 83.5% respectively. Restoration was thus incomplete in all three age groups, and the ratio did not return fully to the intact profile at any age.

Conclusion. The white-to-red pulp ratio behaves as a monotonic, age-calibrated and treatment-responsive variable, and therefore qualifies as a practical quantitative criterion of splenic remodelling in experimental nephrotoxicity. Interpreting it requires age-matched reference values, since an identical ratio may denote physiological involution in an old animal and severe pathological remodelling in a young one.