The human rachis: can it be considered a shock absorber (that was produced by exaptation) rather than a column?

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Our paper is focused on two fundamental points: the first one is a terminological proposal and the second one is a question. Obviously these two things are strictly related one another.
The terminological proposal is aimed to name "vertebral shock absorber" the human rachis (globally considered, when it is in physiological conditions) in its most typical function: to sustain static/dynamic stresses, that moreover are directed according to its axial direction, obviously when this coincides with gravitational line. This aspects can be studied by modal analysis and by the model of *Eigenvectors* and *Eigenvalues*. According to our opinion, the mechanical feature must be considered as prevalent if compared with the structural one. Following it human rachis is usually named "column".
This mechanic sustain is distributed on three lines that are summarily parallel and are linked one another (by isthmuses and vertebral arches to build an horizontal ring) so they can be considered a unique compact viscous-elastic system. Each one of these three vertical sub-structure is built as a stacking of metameric elements (modules) along a continuous line.
This spatial linear disposition is regarding: vertebral bodies (that are alternated with inter-vertebral discs and are placed on the median line) and articular processes of vertebras (two symmetric lines posterior to vertebral bodies).
In chordates' notochord, in fishes' rachis and in the vertebral "beam" of tetrapods the solicitations are transversal and trend to disaggregate the vertebral chain. Instead, in human pilaster the main static solicitation, the gravitational charge, trends to make it collapse: the reciprocal pressure pushes the vertebras one against the others. Sagittal physiological curves seem a partial retreat under the gravitational charge, a beginning breaking of vertebral instable balance. Maybe it is so, but the sinuous shape of human rachis makes it much more resistant to further charges, both static (to lift something) and dynamic (falling down after an elevation jump). The curves elastically become more/less empathized and so they make the human rachis a very efficient shock absorber.
The related question is if we can define "exaptations" evolutionary jumps of rachis: from central axis of first fishes living in water to beam of terrestrial tetrapods, to shelf in first bipeds, to column or, as we propose, vertical shock absorber in human beings. In both cases, of a positive or of a negative answer, it could be opportune to establish criteria and limits to define an evolutionary transformation as "exaptation" or "not-exaptation".
The transformation of the function of the exoskeleton of arthropods (from protective shell in many water species to locomotion sustain in terrestrial species), of the feathers (from thermal defense in Dinosauria to aerodynamic structures in Birds) and of the appendixes of vertebrates (from fins in water species to paws in terrestrial tetrapods) have been considered exaptations. Similarly we propose of considering exaptation the change of mechanical function of human rachis.
Anyway every transformation is a change of function and/or of structure, but it could be heuristically interesting to have criteria and limits available to classify each case.