Application of a quark-hadron hybrid equation of state to rotating neutron stars.

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Neutron stars are often described as ``astrophysical laboratories" because they display diverse physical phenomena. The stars have extremely high density, strong magnetic fields, strong gravity and rapid rotation. Stars that rapidly rotate at several hundred hertz are called ``millisecond pulsars". It is believed that exotic physical phenomena appear in and/or around such stars. The mass--radius relation is an important feature of neutron stars and has been described in theoretical studies by the Tolman--Oppenheimer--Volkoff (TOV) equation. However, several recent studies have suggested limitations of the theoretical studies. In particular, the TOV equation assumes that the star is spherical. Neutron stars are observed as pulsars, which are known to have fast rotation. Such stars should be elliptical rather than spherical because of the rotation effect. For instance, many theoretical studies have attempted to account for the rotation effect of rapidly rotating neutron stars. Accordingly, we also apply our EOSs to rapidly rotating stars. In this study, we focus on the investigation of the inner structures and the application of our EOSs to rotating stars. We find that one of our EOSs is consistent with observations, and another is inconsistent. We also find an important relation between the radius and rotation.