$$
\begin{aligned}
p\left(y_i \mid X,\beta,w\right) &= \int p\left(y_i \mid X,\beta,w,\lambda_i\right) p\left(\lambda_i \mid X,\beta,w\right) d\lambda_i \\
&= \int p\left(y_i \mid X,\beta,w,\lambda_i\right) p\left(\lambda_i\right) d\lambda_i \\
&\propto \int \left(\lambda_i w\right)^{1/2} \exp\left(-\frac{w\lambda_i}{2}\left(y_i - x_i^\top \beta\right)^2\right) \lambda_i^{h/2-1} \exp\left(-\frac{h}{2}\lambda_i\right) d\lambda_i \\
&\propto \int \underbrace{\lambda_i^{h/2-1/2} \exp\left(-\left(\frac{w}{2}\left(y_i - x_i^\top \beta\right)^2 + \frac{h}{2}\right)\lambda_i\right)}_{\Gamma\left(\frac{h+1}{2},\frac{w}{2}\left(y_i - x_i^\top \beta\right)^2 + \frac{h}{2}\right)} d\lambda_i \\
&\propto \Gamma\left(\frac{h+1}{2}\right)\left(\frac{w}{2}\left(y_i - x_i^\top \beta\right)^2 + \frac{h}{2}\right)^{-\frac{h+1}{2}} \\
&\propto \left(\frac{w}{h}\left(y_i - x_i^\top \beta\right)^2 + 1\right)^{-\frac{h+1}{2}}
\end{aligned}
$$

$$
y_i \mid X,\beta,w \sim t_h\left(x_i^\top \beta, w^{-1/2}\right)
$$